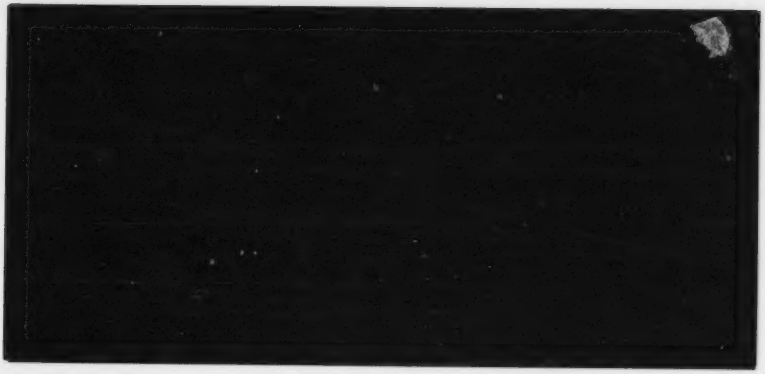
Economic Council
of Canada

Conseil économique
du Canada

Working Paper
Document de travail



Working Paper No. 2

The Natural Rate of Unemployment:

A Regionally Disaggregated Approach

Andrew Burns

1990

91-01567/

The Natural Rate of Unemployment

The findings of this study are the personal responsibility of the author and, as such, have not been endorsed by the Members of the Economic Council of Canada.

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Foreword

Over the last quarter of a century employment rates in Canada have risen dramatically and the absolute difference between provincial unemployment rates has risen all the more dramatically. Unemployment is both a personal and social burden and its minimization remains one of the principle responsibilities of elected governments. As the inflation of the 1970s made abundantly clear, however, it is not always possible to reduce unemployment, either at the regional or national level, but simple policies of aggregate demand. Rather, in formulating unemployment policy it is necessary to take into account the nature of the unemployment currently observed.

In this study the author provides an analysis of provincial unemployment rates which illuminates the impact which various economic events and trends, such as the oil and commodity price shocks have had upon provincial economies. Each provincial unemployment rate is disaggregated into its structural, policy, terms of trade and cyclical components. Examination of the disaggregation permits the reader to evaluate the relative impact of various factors in the evolution of provincial unemployment rates as well as the relative merits of demand and structural based unemployment policies.

The analysis suggests that the large majority of the increase in unemployment witnessed over the last quarter of a century has its root in structural factors, particularly the turmoil generated by the oil shocks and lower commodity prices. To the extent that government policies have impacted unemployment rates, their influence has been to reduce them in recent years. The estimates of cyclical unemployment presented do not suggest much scope for a broadly based demand based unemployment policy at the time the research was completed in 1988.

This paper was prepared by Andrew Burns, an economist on the staff of the Council. It was undertaken as part of the Council's assessment of Canada's medium term performance and outlook for its 25th Annual Review, Back to Basics. The findings of this study are the personal responsibility of the author and, as such, have not been endorsed by the members of the Economic Council of Canada.

Judith Maxwell
Chairman

Abstract

The paper presents quarterly estimates of the natural rate of unemployment (NRU) for each of the ten Canadian provinces over the period 1963-86. The paper expands upon earlier work conducted at the aggregate national level, which showed that estimates using the Lilien methodology of modelling changes in frictional unemployment by an employment dispersion index resulting in biased estimates. Unemployment rates for each of the ten provinces are modelled in a reduced form against cyclical, structural, policy and terms of trade variables using a SUR methodology.

The paper models the turmoil generated by the oil shocks of the seventies by the relative price of energy. Relative export prices for commodities important to individual provinces are also used as proxies for changes in the terms of trade. Minimum wages legislation and unemployment insurance are among the government policies whose influence is accounted for.

Natural rates in all provinces show a tendency to rise significantly throughout the sample period. This is especially the case for Eastern and Western provinces, which appear to have been particularly sensitive to commodity price changes. Unemployment insurance could not be statistically identified as a contributor to increased unemployment. In some Atlantic provinces, wage drift from Ontario was identified as a significant cause of increased unemployment rates.

Acknowledgment

An earlier version of this paper was widely distributed in October 1988. As is often the case, the debt of appreciation incurred in preparing this paper is deep and widely distributed. I benefited greatly from comments and discussions with colleagues at the Economic Council. I would like to especially thank without implicating, Mary MacGregor, Stephen James, Jean-Paul Aubry, Keith Newton, Neil Swan, and Pierre Fortin, all of whom provided detailed comments on earlier drafts. I would like to express my deep appreciation to Ross Preston whose patient guidance and critical eye have contributed much of what is good in this paper. Pierre Fortin graciously provided data and ideas during the early development of this paper. All errors, omissions and conclusions remain my responsibility alone.

Introduction

In Burns (1988) the Canadian natural rate of unemployment (NRU) was estimated to be 7.6 per cent in 1987. The unemployment rate in that year averaged 9.2 per cent implying considerable slack remained in the economy. At the same time, however, unemployment in Ontario was 6.3 per cent and in Newfoundland the rate was 18.9 per cent. What conclusions is one to draw? Was Ontario running at below full unemployment while Newfoundland was in the midst of a depression? Why have unemployment rates increased? And why, despite government policies aimed expressly at reducing regional disparities, have provincial unemployment rates drawn further apart rather than closer together?

Canada is, above all, a nation of regions; and the Canadian economy is in fact the sum of several sub-economies, each of which responds in a different way to events in the economic and social environment. No one would deny that full employment in Ontario means something quite different from full employment in Newfoundland, nor that the set of factors which impact employment in the Prairies are quite distinct from those which cause unemployment in British Columbia to fluctuate. Despite these self evident truths there exists, to our knowledge, no methodologically consistent examination of provincial labour markets and no consistent estimates of provincial natural rates of unemployment.

This paper seeks to fill that void, it extends upon Burns (1988) by examining unemployment in Canada as a provincial phenomenon. We follow that paper basic's methodology, which showed that a fully specified reduced form model of the unemployment rate dominates models, such as those of Lilien (1982) for the United States and Samson (1985, 1986) for Canada which provide for only a limited set of explanatory variables. Provincial unemployment rates are modelled as functions of cyclical, structural, policy and terms of trade variables. Natural rates are calculated by setting cyclical variables to their full employment or "normal" values and solving for the cycle free or "natural" unemployment rate. A national natural rate is derived by weighting the provincial natural rates by their labour force shares.

A provincially disaggregated study of unemployment provides for a much richer and detailed picture of Canadian unemployment. Disaggregation implies that each labour market under investigation

will be more homogenous, permitting a more precise identification and quantification of the factors influencing unemployment. A disaggregated approach provides for a much more flexible functional form. Whereas in an aggregated study all provincial coefficients are implicitly constrained to be equal across equations, a disaggregated approach allows provinces' coefficients to reflect their different sensitivities to factors in the economic environment. Finally a disaggregated approach, by generating estimates of natural rates of unemployment for each and every province as well as quantitative estimates of the importance of various factors in the evolution of those rates, provides policy-makers with a degree of regional detail which has hitherto been absent. The availability of provincial natural rates implies the possibility of making policy conform to regional needs. If estimates of provincial natural rates suggest that cyclical unemployment is a problem in Ontario, while structural unemployment is more a problem in Newfoundland, then government unemployment policy can be made more effective if it is shaped to reflect these differences.

This paper is divided into five parts: 1) the introduction; 2) a brief discussion of the various variables employed and their economic content; 3) a presentation of the econometric results; 4) a calculation of the ten natural rates and an examination of the relative importance of various factors in the time path followed by unemployment in the provinces; and 5) a summary of results and discussion of policy implications.

The Model

In Burns (1988) we examined some of the reasons behind the wide disagreement between published estimates of the Canadian natural rate of unemployment (NRU). Estimates of Canada's NRU based upon Lilien's (1982) methodology, *ie.* Samson (1985, 1986, n.d.), tend to follow very closely the actual unemployment rate while those which follow a Phillips curve methodology, such as Fortin (1988), tend to produce much lower estimates. A major conclusion of Burns (1988) is that the Lilien-Samson methodology produces biased estimates because it artificially constrains the set of explanatory variables to money shocks, employment dispersion and in Samson's case the U.S. unemployment rate.[1] A reduced form methodology, that allows for a wide range of explanatory variables, was found to dominate the

constrained model and resulted in a natural rate more in line with traditional estimates. In the context of a fully specified equation the Lilien dispersion index was unable to explain a significant amount of the variation in unemployment.

The model presented here follows up on these results. Provincial unemployment rates are modelled in a reduced form as a function of four *types* of regressor: cyclical, structural, policy and terms of trade. The model incorporates many of the same explanatory variables used in Burns (1988) as well as several new ones with a more distinctly provincial or regional flavour. The theoretical rationale for many of the variables used was discussed in some detail in our previous paper and is, therefore, given only brief treatment here. Interested readers are encouraged to consult the original authors. The functional form and the different proxies which we settled upon for the prototypical provincial unemployment rate equation were determined after some experimentation and are presented below. In certain cases coefficients were constrained, on *a priori* theoretical or statistical grounds, to equal zero.

$$\begin{aligned} RLURi_t = {} & \beta_1 RLURi_{t-1} + \beta_2 GAP_t + \beta_3 CUR_t + \beta_4 MONPOL_t \\ & + \beta_5 DGDPKi_t + \beta_6 RLPGi_t + \beta_7 S_ENGi_t \\ & + \beta_8 UNION_t + \beta_9 TAX_i_t + \beta_{10} SUB_i_t \\ & + \beta_{11} UIOPPi_t + \beta_{12} RWAGEi_t + \beta_{13} WMRi_t \\ & + \beta_{14} HYSTi_t + \beta_{15} PMILL_t + \beta_{16} PPULP_t \\ & + \beta_{17} RPGRAIN_t + \beta_{18} PMINE_t) \end{aligned} \quad (1)$$

Precise variable definitions can be found in the Data Appendix. The subscripted t represents time while the italic i represents a one letter suffix indicating province.

Where:

F = Newfoundland
S = Nova Scotia
Q = Quebec
M = Manitoba
A = Alberta
P = Prince Edward Island
N = New Brunswick
O = Ontario
K = Saskatchewan
B = British Columbia

Cyclical Factors

GAP, CUR, MONPOL, and DGDPK*i* are meant to proxy cyclical fluctuations in the economy. GAP is a measure of demand deficient unemployment calculated as the difference between the national unemployment rate and the natural rate of unemployment as estimated in Burns (1988). CUR is the Bank of Canada's capacity utilization rate, while MONPOL is an indicator of the tightness of monetary policy, MONPOL $\equiv \dot{M} - \dot{P} - \dot{Q}$. When MONPOL is zero monetary policy is neutral (the rate of monetary expansion is equal to the rate of growth of output and inflation). When it is positive, monetary policy is expansionary and when negative, deflationary.

Provincial economies differ in the mix of goods they produce. It is likely, therefore, that the degree of cycle experienced in any given province will vary both across provinces and within provinces (as the nature of the cycle changes from one cycle to the next). Deviations from the trend rate of growth of provincial GDP reflect the purely provincial aspects of a cycle which an aggregate measure such as GAP cannot hope to capture. DGDPK*i* is the deviation of provincial constant dollar GDP from trend where the trend is calculated following the methodology of Prescott (1986).

Finally, the unemployment rate in the relatively heavily industrialized provinces of Ontario and Québec is likely to be more sensitive to cycles which affect heavily capitalised industries *per se*, therefore we include CUR as an additional regressor in these equations.

Structural Factors

RLPG*i*, S_ENF*i*, UNION, RWAGE*i* and HYST*i* are meant to model changes in the economy which have lead to changes in the level of structural unemployment. These are technological, sociological or otherwise exogenous developments which have changed the nature of labour markets. Unemployment arising from these factors is not amenable to demand side policies although a well considered supply side policy package might be capable of providing some relief.

The oil shocks of the 1970s were arguably the most significant economic events of the second half of the 20th century causing turmoil on both the demand side and the supply side of the economy.

Baily (1981), using a vintage capital model, describes how an oil shock, operating through the supply side, could affect the productivity of existing capital goods leading to premature scrapping and lost output.[2] Hamilton (1988) in a strong theoretical treatment examines the other side of the coin. His paper notes that energy, although a relatively small component in the cost of producing goods, is a ma, input into the consumption of many important consumer goods. Hamilton presents a general equilibrium model where a substantial increase in the cost of energy leads to significant changes in consumer demands and changes in the pattern of employment much greater than would be expected if the energy were treated only as a factor of production. His (1983) observation that all but one post-world-war U.S. depressions were preceded by an exogenous oil price shock is supported by several empirical works which demonstrate that fluctuations in energy prices can be critical determinants of unemployment.[3]

RLPG*i* is a measure of the relative price of energy taken as the ratio of the price of energy to provincial CPI. In our model we assume that RLPG*i* proxies for the kind of structural change described by Lilien (1982) operating through both the demand side as described by Hamilton and through the supply side as per Baily.

S_ENG*i* is an attempt to proxy for structural change from causes other than the energy shocks.[4] It is the Lilien (1982) employment dispersion index purged of the influence of cycles and the energy shock.[5]

In a world with imperfect markets there may be a tendency for high wages in areas of high productivity to spillover into areas of lower productivity. Higher than warranted real wages in low productivity regions lead to unemployment and the misallocation of resources.[6]

Drewes (1987) has found evidence in support of regional wage spillover between Ontario and Atlantic Canada. In the early 1970s real wages in the Atlantic Provinces rose significantly relative to the real wage in Ontario. Presumably these increases were due to heightened awareness of the real wage effects of inflation and of wage settlements in other areas of the country. If increases in productivity were not experienced concomitant with these relative wage increases then economic theory[7] would lead us to expect an

increase in the rate of unemployment. We attempt to capture the unemployment effects of wage spillover in the Atlantic Provinces with RWAGE*i*, the ratio of the average provincial manufacturing wage to the average provincial manufacturing wage in Ontario.

UNION is the percentage of the Canadian labour force who are members of unions. Several theoretical arguments suggest that union power might play a role in increasing unemployment. The most common argument is that union monopoly power permits labour to demand and receive a higher than marginal product wage, which drives a wedge between labour demand and labour supply resulting in increased levels of unemployment.

The failure of European unemployment rates to fall in the post-1982 period has been labelled hysteresis. Something is said to be characterised by hysteresis if, after being exposed to a force which displaces it from a position of rest, it has no tendency to return to that position once the force is removed. Papers by Blanchard and Summers (1986), Hargreaves Heap (1980), Lindbeck and Snower (1988a, 1988b, 1987) and Cross (1987) are broadly representative of recent work concerning hysteresis. Theoretically, hysteresis arises because of an asymmetry in the operation of the labour markets such that workers once laid off find it more difficult to be re-hired or find new employment even when the factor which initially lead to the lay-off ceases to hold sway.

Among the factors most frequently cited as causing hysteresis are:

1 monopoly power of already employed workers (insider/outsider labour markets, see Blanchard and Summers [1986], Jones [1987a] and Summers [1986]);

2 imperfect information: firms use past unemployment experience as an indication of suitability for work (Lindbeck and Snower [1987, 1988a, 1988b] and Jones [1987b]) or hysteresis arises due to an efficiency wage phenomenon where profit maximising firms with imperfect information as to individual worker productivity pay a higher than marginal product wage so as to ensure high levels of worker output (Rebitzer [1988], Jones [1987b]);

3 skill deterioration: prolonged unemployment may result in a deterioration of human capital both in terms of skills and work habits (Hargreaves Heap [1980]).

The variable HYST*i* is defined as the percentage of the labour force who are union members times the one period lagged change in the provincial unemployment rate. A situation of pure hysteresis would exist if $1/(1-\beta_1)$ times the rate of unionisation times the estimated coefficient on HYST*i* were equal to one.[8] In that instance any change in the unemployment rate would be permanent. Inclusion of the degree of unionisation in our hysteresis proxy allows the role of hysteresis to vary over time in tandem with one of its theoretically important determinants.[9]

The lagged dependent variable is included in the regressions, both in an effort to model the dynamics of the system and as an effort to measure the *relative* persistence of unemployment. Persistence and hysteresis are related notions. Persistence refers not to the failure of unemployment to return to its previous state but its sluggishness in doing so. The larger the coefficient on lagged unemployment the more persistent is unemployment up to the limiting case where β_1 equals one implying pure hysteresis. The size of the lagged dependent variable gives us an indication of the magnitude of persistence effects. It does not shed light on the causality behind greater or lesser degrees of persistence. Barro (1988) investigates some of the causes for international differences in persistence.

Policy Factors

TAX_*i*, SUB_*i*, UIOPP*i* and WMR*i* are policy variables. They represent factors in the economic environment which are under direct control of policy-makers and which might impact labour market behaviour.

TAX_*i*[10] is the percentage of provincial GDP paid in provincial and federal taxes. Income taxes and payroll taxes, implicit or otherwise, create a wedge between the real wage paid by firms and the marginal product of workers, and between the real wage received by workers and their subjective marginal disutility of work. The employment effects of this wedge are unambiguously negative although the effects on unemployment will depend upon whether the reduction in supply is greater than the reduction in labour demand. Nonetheless our expectation is that the net effect would be to increase unemployment.

There are those who would argue that crowding out due to government involvement in the economy might be a significant factor in increasing unemployment. TAX_*i* by implicitly modelling government's revenue as a share of provincial GDP may also proxy for such an effect. Its expected sign in this case is also positive.

SUB_*i* is equal to the total of government subsidies to private business divided by provincial GDP. To the extent that government subsidisation is effective as an employment generator and at removing distortions in the economy we would expect SUB_*i* to be negatively correlated with unemployment.[11]

Unemployment insurance reduces the opportunity cost of job search while unemployed and cæteris paribus can be expected to lead to increased levels of measured unemployment. Both the theoretical and empirical literature on unemployment insurance's effects are voluminous. In addition to subsidising prolonged job search, Gregory and Duncan (1980), *inter alia*, found that unemployment insurance increased youth participation rates while leaving labour demand unchanged implying higher rates of measured unemployment. Summers (1988) presents an efficiency wage model where small changes in unemployment insurance generosity have large unemployment effects. UIOPP*i* is a derivitive of Fortin's (1988) measure of unemployment insurance generosity, the theoretical rationale for this particular proxy is provided in Fortin (1984). The provincial content of the variable enters through the replacement wage ratio.

WMR*i* is the ratio of provincial minimum wage to average manufacturing wage. A minimum wage is a constraint on labour markets which, if binding, will result in some jobs not being offered and an excess supply of low wage labour and thus increased levels of unemployment. In addition Grossman (1983) argues that minimum wages lead to distortions in the wage structure and increased mismatch due to worker's concerns with relative wages. WMR*i* is excluded as an explanatory variable from the equations for the Atlantic provinces due to problems of collinearity with the variable RWAGE*i*.

Terms of Trade

RPGRAIN, PMILL, PPULP, PFISH and PMINE are the ratios of the price of various Canadian exports to the consumer price index.

They are included in an effort to model changes in Canada's terms of trade. RPGRAIN is the relative price of grain products, PMILL the relative price of milled wood produce, PPULP the relative price of pulp and paper produce, PFISH the relative price of fish and fish based products and PMINE the relative price of mining output. Under the small country assumption these prices are largely exogenous to the Canadian economy. Changes in these prices constitute exogenous changes to the environment in which the Canadian economy operates. Their effects on unemployment are structural in that they are not the result of fluctuations in domestic aggregate demand but of forces exterior (parametric) to the system.

Econometric Results

Our model consists of a system of ten equations -- one for each of the Canadian provinces. Because the errors are likely to be correlated across equations, estimation efficiency is gained by using Zellner's seemingly unrelated regression (SUR) technique. All results reported are based upon a nested hypothesis technique applied to the SUR estimates. Due to the computational expense of the initial estimating runs, more than one variable, to a maximum of three, was eliminated from each equation in the first run if they were 1) incorrectly signed and statistically insignificant, and 2) had a "t" score less than 0.5. In subsequent runs variables were eliminated one at a time if they were statistically insignificant.

Appendix A describes how certain anomalies in the nested hypothesis testing process were dealt with. Tables A-1 to A-10 show the progression of the models as variables were eliminated. Table 1 presents the final form of our ten equations. All coefficients have the right sign and are significantly different from zero. The Q statistic for each equation under the null hypothesis of normal errors is distributed χ^2 with a critical value of 40.11 at a 95 per cent level of confidence. With the exception of the equations for Nova Scotia, Ontario and Québec we are unable to reject the hypothesis of no serial correlation. A relaxation of our test to a 99 per cent level of confidence prevents us from rejecting the hypothesis in all cases except Ontario. Overall our regressions seem well specified, R^2s are high for all equations and for the majority there is no indication of serial correlation in the residuals. Where there is some indication of serial correlation, the evidence is marginal.

Table 1

Estimates of Reduced Form Provincial Unemployment Rate Equations

	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick	Québec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
RLURF	0.6890 (13.20)	0.4132 (5.23)	0.5301 (7.77)	-0.6407 (11.07)	0.6670 (12.29)	0.4984 (8.09)	0.4194 (5.16)	0.6914 (13.05)	0.5586 (9.49)	0.6624 (13.74)
CYCLICAL										
GAP	0.3720 (2.30)	0.3670 (2.22)	0.3098 (3.54)	0.1891 (1.96)	0.2419 (3.28)	0.2948 (5.30)	0.3597 (4.31)	0.0925 (1.65)	0.3619 (5.29)	0.3772 (4.68)
CUR					-0.0504 (-4.56)	-0.0808 (-7.62)				
DGDPK1			-5.9277 (-1.60)		-12.4618 (-5.03)	-7.1155 (-2.66)	-7.6106 (-2.65)	-2.8457 (-3.68)	-3.2560 (-1.67)	-6.4339 (-2.42)
STRUCTURAL										
RLPG1	3.5874 (2.22)	5.1255 (3.05)	4.1025 (4.46)	3.2528 (3.20)	3.6853 (4.37)	2.0519 (3.16)	5.1986 (5.81)	2.5846 (4.42)	3.7113 (4.04)	1.6225 (1.84)
UNION						11.0124 (4.82)				19.6855 (5.94)
S_ENG1								8.5565 (2.90)		7.2396 (2.04)
HYST1					0.4236 (1.59)	0.4630 (1.97)	0.7458 (2.55)			0.4920 (2.02)
POLICY										
RIAGE1	10.8756 (3.87)		10.6211 (3.33)	11.8155 (3.54)						

UIOPPi		0.7023 (3.05)		0.5977 (3.59)				0.1666 (1.81)		
TAXi_	9.3852 (1.76)		7.8382 (3.12)				12.5785 (2.95)		15.7062 (5.25)	
SUB_			-3.9492 (-1.69)							
UMRi					3.3082 (3.21)	2.2637 (2.14)	3.5111 (1.83)		27.3591 (3.34)	
TERMS OF TRADE										
PFISH				-1.4278 (-1.76)						
PMILL										-1.2750 (-3.22)
PPULP						-0.7119 (-1.92)			-3.5091 (-5.50)	
PMINE	-1.0224 (-1.48)									-1.5689 (-3.29)
EPGRAIN							-0.2183 (-3.53)	-0.2068 (-3.16)		
CONSTANT	-7.5943 (-3.99)	0.1813 (0.15)	-8.5561 (-3.65)	-8.6665 (-4.10)	2.3473 (1.45)	4.4948 (3.36)	-2.9646 (-2.38)	-0.3712 (-1.04)	1.1385 (1.78)	-1.5731 (-2.05)
R^2	0.95	0.81	0.97	0.97	0.99	0.98	0.95	0.96	0.97	0.98
SEE	1.06	1.28	0.53	0.63	0.33	0.30	0.46	0.40	0.46	0.50
Q(27)	22.33	27.44	56.10	40.14	53.32	40.35	32.99	39.79	25.17	24.95

Sensitivity Analysis

In the context of a reduced form methodology one of the most important "tests" of an equation is the economic sense of its estimated parameters both in terms of sign and magnitude. A statistically well specified equation can be econometrically poorly specified if it attributes a role to a variable which makes little economic sense. We have already addressed questions of sign and statistical significance: in the following section we discuss the impact, implied by our estimates, of each regressor on provincial unemployment. Appendix B contains ten tables, each of which details the changes in the unemployment rate since 1963 which were "caused" by the various non-cyclical independent variables. The tables and references in the following section of the main text are drawn from the data in the tables in Appendix B.

Persistence

As we outlined earlier the coefficient on lagged unemployment provides us with a means of judging the relative persistence of unemployment across provinces. Taken at face value it can be used to develop a measure of the amount of time required for the full effects of a shock to be felt.[12] Alternatively, given the naivete of our "model" of persistence, it can be considered as an index of persistence where larger numbers imply markets where shocks take longer periods to work themselves out and smaller numbers imply shorter periods of adjustment. Table 2 presents the estimated persistence factors for the ten provinces and the implied adjustment period. The adjustment period ranges from a high of 7Q in Newfoundland to a low of 3Q in Prince Edward Island. The ordinal ranking of provinces' adjustment periods is more or less as one would expect. Ontario which is the most industrialized and densely populated province has one of the lowest adjustment periods, suggesting that markets in that province operate the most efficiently. Similarly, Newfoundland whose industry is largely underdeveloped has a long lag, implying that adjustment is slow and difficult in that province with opportunities for alternative employment few in number.[13] Other provinces adjustment coefficients, except Prince Edward Island's, are consistent with this story.

Table 2

Unemployment Persistence, by Province

	Coefficient	Speed of Adjustment
Newfoundland	.6890	7Q
Prince Edward Island	.4132	3Q
New Brunswick	.6407	5Q
Québec	.6670	6Q
Ontario	.4984	4Q
Manitoba	.4194	4Q
Saskatchewan	.6914	7Q
Alberta	.5586	4Q
British Columbia	.6624	6Q
Nova Scotia	.5301	4Q

Cyclical Sensitivity

Our estimates of the natural rates of unemployment implicitly define estimates of cyclical rates of unemployment. In our discussion of the interpretative difficulties involved in applying a national NRU to disparate regions we noted that there was no *a priori* reason to expect the cyclic sensitivity of each province to be the same. Table 3 reports the percentage point increase in provincial unemployment resulting from a one percentage point increase in the aggregate unemployment rate.[14]

As expected the Prairies are to some extent "recession proof" as are the Atlantic Provinces reflecting these regions reliance on relatively cyclically stable sectors.[15] Of the provinces Newfoundland, Ontario, Québec and British Columbia tend to be more cyclically sensitive. For Ontario and Québec, and to a lesser extent British Columbia this relative sensitivity can be explained by these provinces' greater reliance on industry for employment.

Newfoundland's cyclical sensitivity is less easily explained. It is unlikely that demand for Newfoundland products is unusually cyclical. What is more likely is that Newfoundland firms have a more elastic demand for labour than does the average Canadian firm. This would be consistent with a scenario where Newfoundland firms were only marginally profitable and had little fat with which they could absorb demand fluctuations. It is also consistent with a society where unemployment insurance (and thus unemployment) has become accepted as a legitimate form of income subsidisation.[16] In such a

society, the stigma and subjective cost of unemployment is reduced. Cæteris paribus, we would expect the probability of being and remaining unemployed to rise.

Québec's relatively greater cyclical sensitivity contrasts with results reported by Harvey (1956, 1957) and Raynauld (1988) but is in line with work by Thirsk (1973).[17] Nonetheless the extent of the differences in estimated sensitivity (between Ontario and Québec) is not large and one is reluctant to place too much significance upon them.

Table 3

Provincial Cyclical Sensitivities, by Province	
Newfoundland	1.15
Prince Edward Island	0.70
Nova Scotia	0.61
New Brunswick	0.51
Québec	1.17
Ontario	1.10
Manitoba	0.63
Saskatchewan	0.28
Alberta	0.50
British Columbia	1.12

Structural

Table 4 outlines the impact of increased energy prices on unemployment between 1963 and 1985 and the impact of their subsequent fall on unemployment between 1985 and 1986. The size of the impact in the non-industrial Atlantic and Prairie Provinces, over three percentage points, suggests that the mechanism through which the unemployment was generated bears a closer relation to Hamilton's demand side story than Baily's premature obsolescence theory.

The relatively slight effect observed in the Ontario and British Columbian equations is curious. Both equations include among the other significant regressors the variable UNION, the percentage of the labour force members of a trade union. It is possible that some of the energy shocks effects are being picked up by this variable and that the magnitude of its impact is being over estimated. Conversely

Table 4

Unemployment Impact of Energy Shocks, by Province, 1963-85 and 1985-86

	1963-85	1985-86
Newfoundland	3.78	-1.10
Prince Edward Island	3.30	-0.81
Nova Scotia	3.36	-0.94
New Brunswick	3.28	-0.95
Québec	4.12	-1.27
Ontario	1.43	-0.46
Manitoba	3.34	-1.03
Saskatchewan	3.54	-0.88
Alberta	3.24	-0.93
British Columbia	1.79	-0.52

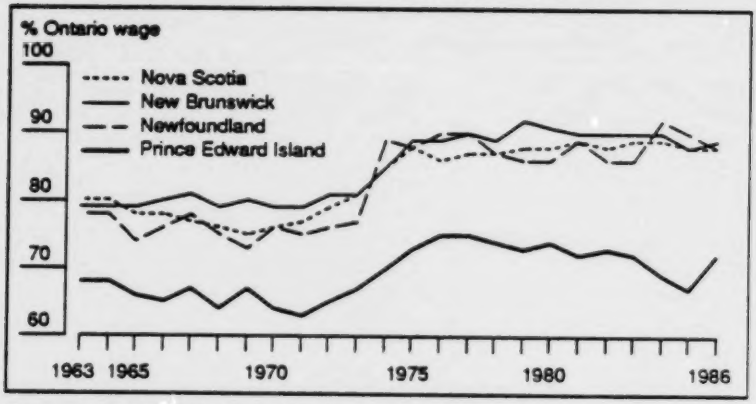
it is possible that RLPG*i* in the other equations is proxying for some contemporaneous and unmodelled factor whose effect in the Ontario and British Columbia equations is being captured by UNION. It is a limitation of our reduced form analysis, and of our macro data, that we are unable to determine which, if either, of these explanations is correct.

Real wages in the Atlantic provinces would appear to have played an important role in the rise of unemployment rates between the sixties and eighties. Between 1963 and the end of 1972 the Newfoundland average industrial wage was 75.96 per cent of Ontario's. Between 1973 and 1987 it was 87.49 per cent of the Ontario wage. There is no compelling evidence that we are aware of suggesting that this improvement in Newfoundland's relative wage could be explained by increases in productivity. A more likely explanation lies in the wage spillover argument. As inflation became more pronounced in the 1970s wage bargainers began to pay more attention to wage settlements in other labour markets in determining their own reservation wages. As a result, settlements in the Atlantic Provinces began to reflect more closely the productivity conditions in Central Canada, not those of Eastern Canada.

Our estimates suggest that the Newfoundland unemployment rate rose by as much as 2.34 percentage points after 1973 due to wage spillover.[18] Similar, though less pronounced effects were observed in Nova Scotia and New Brunswick (See Table 5). Chart 1 shows wages in the Atlantic Provinces relative to the Ontario wage. In all cases mid 1973 marks the beginning of a steep rise which is more or less terminated by 1974.

Chart 1

Atlantic Provinces Manufacturing Wage as a Proportion of Ontario Manufacturing Wage, 1963-86



Source Economic Council of Canada, 1989.

Table 5

Unemployment Impact of Wage Spillover for the Post-1973 Period

Newfoundland	2.34
Nova Scotia	1.02
New Brunswick	1.08

UNION, the percentage of the labour force who are members of trade unions is meant to proxy for labour monopoly power. UNION is significant in the unemployment rate equations of Ontario and British Columbia. The estimated impact of increased labour power on unemployment in Ontario is reasonable -- a 1.64 percentage point rise between 1963-86. In British Columbia, however, the impact seems excessively large, 4.08 percentage points over the same period. British Columbia has had a history of turbulent management-labour relations, which *cæteris paribus* should lead to substitution away from labour and therefore increased unemployment. However, it is difficult to believe that, however rancorous relations may have been, management-labour strife has lead to a 4 percentage point increase in the unemployment rate.

One is more inclined to believe that UNION is proxying for some other effect. The fact that the sum of UNION's and RLPGO's impact on unemployment is approximately equal to RLPG*i*'s impact in most other provinces suggests that perhaps in the British Columbia and Ontario equations UNION is proxying for some effect which in the other provinces is being captured by RLPG*i*. In discussing the role of RLPG*i* we suggested that it models both the disruptive effects of the oil shocks *per se* as well as the dislocative effects of the rationalisation and revitalisation process which the ensuing recession and monetary squeeze engendered. It is possible that in the Ontario and British Columbian cases that some of these effects are being modelled by UNION and not RLPG*i*.

The final two structural variables are HYST*i* and S_ENG*i*. S_ENG*i*, the employment dispersion variable, is supposed to proxy for structural change deriving from sources other than the oil shocks. It was significant only in Saskatchewan and British Columbia. Its effect was much more important in Saskatchewan, where it contributed to as much as a 2.78 percentage point increase in the rate of unemployment in 1975 as opposed to its 1963 level (see Table 6). HYST*i* had statistically significant unemployment effects in Québec, Ontario, Manitoba and British Columbia. The magnitude of the effects, however, was not large (see Table 7).

Table 6

Employment Dispersion's Contribution to Changes in Unemployment

	Maximum	Average
Saskatchewan	2.78	0.76
British Columbia	0.64	0.18

Table 7

Hysteresis' Contribution to Changes in Unemployment

	Maximum	Average
Québec	0.47	0.10
Ontario	0.36	0.06
Manitoba	0.23	0.11
British Columbia	0.79	0.13

Policy

Unemployment insurance had significant unemployment effects in three provinces: Prince Edward Island, New Brunswick and Saskatchewan.[19] Table 8 demonstrates the impact of unemployment insurance on the unemployment rate. The 1972 reforms of the unemployment insurance program had a dramatic impact on unemployment accounting for most of the rise between 1963-1974. The subsequent leisurely decline has largely been the result of reforms to the unemployment insurance system aimed at restricting access.

Table 8

Unemployment Impact of UIC, Selected Provinces, 1963-73 and 1974-86

	1963-73	1974-86
Prince Edward Island	1.56	-0.18
New Brunswick	2.33	-0.38
Saskatchewan	0.80	-0.17

The growth of government and the distortions inherent in the tax system had significant effects on unemployment in Newfoundland, Nova Scotia, Manitoba and Alberta. The tendency in all of these provinces was for taxation's share of output to rise during the sixties, peaking in the mid seventies and fall afterward. The effects on unemployment follow a similar pattern. Table 9 shows the maximum increase in the unemployment rate attributable to taxes and the difference between that rate and the 1986 rate.

Table 9

Increase in Unemployment Due to Tax-based Distortions, Selected Provinces

	Maximum	Present
Newfoundland	2.19	-0.53
Nova Scotia	1.33	-0.20
Manitoba	1.35	-0.59
Alberta	2.05	-1.07

Government subsidies had significant employment effects in only two provinces: Nova Scotia and Alberta. Table 10 shows the change

in unemployment attributed to subsidisation over the periods 1967-73, 1974-81, 1982-86. In Nova Scotia the sign on our estimated coefficient was negative implying that an increase in subsidy was successful in reducing unemployment. In Alberta, however, the sign is positive implying that increases in subsidisation were associated with *increased* levels of unemployment.

Table 10

Unemployment Effects of Subsidisation, Selected Years, 1963-86

	1963-73	1974-81	1982-86
Nova Scotia	0.06	-0.53	0.12
Alberta	0.02	0.52	2.67

Certain factors combine to prevent us from interpreting this result as a condemnation of subsidy policies in Alberta. Much of the subsidisation being recorded in this variable came in response to the oil shock in an effort to spur exploration and develop domestic sources of oil. This is reflected in the high correlation between the price of energy and the level of subsidisation in Alberta ($r = .89$). It is our opinion that the positive correlation between SUB_A and unemployment is spurious. The true causality likely runs from RLPG*i* to both unemployment and SUB_A. Appendix C follows this line of reasoning excluding SUB_A from the unconstrained model on the grounds that it is in fact an endogenous variable. The natural rates and coefficient estimates which result from this process are not greatly different from those reported here.

Minimum wage effects were tested for in all except the Atlantic Provinces. Minimum wage legislation had significant effects on provincial unemployment in Québec, Ontario, and Manitoba, raising unemployment throughout the sixties and early seventies, and has contributed to a decline in unemployment rates since. Table 11 presents the estimated impact on provincial unemployment rates from minimum wage legislation. The first column reflects the change from 1963 to the year where minimum wage induced unemployment reached its peak while the second shows by how much unemployment rates have declined since that maximum was achieved. Although the Québec figure is relatively large, the estimated effects are in line with previously published estimates.

Table 11

Minimum Wage Induced Unemployment, Selected Provinces

	Maximum	Present
Québec	1.24	-2.01
Ontario	0.14	-0.61
Manitoba	0.67	-0.85

Terms of Trade

Changes in the terms of trade can affect the level of employment attainable at any given moment in time. In a resource based economy such as Canada's, fluctuations of international prices can have significant employment effects in the short run. The expectation of future improvement in prices (leading workers to delay changing industries) and the costs of retooling (of both physical and human capital) can lead to structural unemployment. Our equation suggests that such effects were felt in Newfoundland (due to fluctuations in the prices of minerals), in New Brunswick (due to fluctuations in fish and fish produce prices), in Ontario and Alberta (due to variations in pulp prices) in Manitoba and Saskatchewan (due to grain price fluctuations) and in British Columbia (due to both mineral price and milled lumber price fluctuations). Table 12 summarises the effects of these price fluctuations by making reference to the largest unemployment change induced by exogenous price changes and the absolute value by which each provincial unemployment rate can be

Table 12

Effects of Terms of Trade on Provincial Unemployment Rates

	Maximum	Average
Newfoundland	2.25	0.54
New Brunswick	2.20	0.98
Ontario	0.35	0.14
Manitoba	0.84	0.23
Saskatchewan	1.49	0.41
Alberta	1.95	0.77
British Columbia		
(PULP)	2.00	0.54
(MINING)	3.18	0.77

expected to vary due to fluctuations in the terms of trade in any given year. The effects were small in magnitude in Ontario, Manitoba and Saskatchewan. In British Columbia, the Atlantic provinces and Alberta the effects were substantial.

Discussion

The important role which our estimates assign to the relative price of energy variable in determining provincial unemployment rates and the explanation which we have provided in terms of mismatch unemployment is not without support from independent statistical sources. In this section we examine some labour market trends for consistency with the thesis developed to this point.

The effect of the oil shocks, traded commodity price swings and the other structural variables on the mix of demand is illustrated by the acceleration of the transition of the Canadian economy from a goods producing society to a service based economy. In the period prior to and during the 1960s this transition had been occurring at a gradual and evolutionary pace, a pace which, by and large, was continued into the seventies. Table 13 shows the percentage of the employed labour force involved in goods production in 1975, 1980 and 1987 for each of the principal five regions. In addition it shows the absolute change and percentage change in employment share over these periods. There was a clear acceleration in the pace of change between 1975-80 and 1981-87. The second column notes the average natural rate of unemployment for these regions over the period in question as well as the percentage change in that rate. With the Atlantic Provinces being the sole exception, the greater the change in a province's natural rate the greater the acceleration in the transition from a goods to a service based economy. Given the increase in structural unemployment witnessed over this time period, we are inclined to see the accelerating shift from a goods to a service producing economy as reflecting the energy shock's effect on the mix of demand which, in turn, altered the demand for labour which manifested itself as an increase in mismatch unemployment.

Table 13

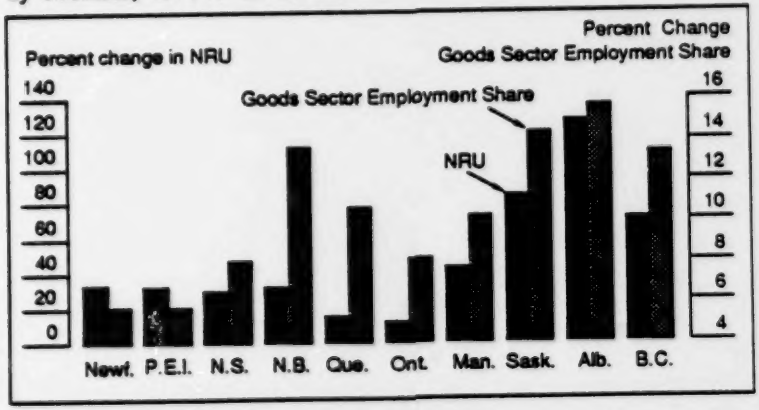
Changes in Regional Industrial Structure and the Natural Rate

	Employment in goods production as a percentage of total employment			Change		Average NRU		
	1978	1980	1987	1975-80	1980-87	1975-80	1980-86	Change
	A	B	C	B-A Percentage	C-B Percentage	Per cent		
British Columbia	29.0	28.0	24.0	-1.0 (-3.4)	-4.0 (-14.3)	7.5	10.6	40
Prairies	35.8	34.1	28.4	-1.7 (-4.7)	-5.7 (-16.7)	4.2	7.0	66
Ontario	35.5	35.4	31.8	-0.1 (-0.3)	-3.6 (-10.2)	5.5	6.1	14
Québec	34.5	32.0	28.6	-2.5 (-7.2)	-3.4 (10.6)	8.6	9.7	12
Atlantic	32.3	31.4	28.8	-0.9 (-2.7)	-2.6 (8.3)	10.8	13.3	23

Chart 2 illustrates the same phenomenon from a slightly different perspective. If one considers the four western provinces there is a clear positive correlation between the percentage change in the NRU and the percentage decrease in the goods producing sector's employment share. Similarly if one considers the central provinces (New Brunswick, Québec and Ontario) the same pattern is apparent, although the percentage increase in the NRU associated with a given change in employment share is much less. Although there is evidence of a similar pattern in the Atlantic region it is not nearly as well defined.

Chart 2

Percentage Change NRU, Goods Sector Employment Share, by Province, 1978-79 to 1984-85



Source Economic Council of Canada, 1989.

The lower elasticity of the NRU with respect to changes in the mix of labour demand is consistent with expectations. The denser labour markets of Central Canada offer more alternative sources of employment to the dislocated worker than do the typically one industry western economies. Therefore the amount of structural unemployment generated by a given shift in mix of demand will be relatively small in the denser economy.

Our contention that the increase in the NRU in the provinces constitutes increased mismatch is given further support by data on long term unemployment (LTU). LTU (defined as spells of unemployment exceeding 52 weeks) is a clear symptom of structural unemployment and given the contemporaneous increase in vacancies which have occurred over this period, of mismatch. Since 1980 the percentage of the unemployed who are long term unemployed has almost doubled and the share of less mobile older workers within the LTU has increased dramatically (23-34 per cent).[20] Both of these developments suggest an increase in mismatch unemployment. The increase in long term unemployment is consistent with workers having difficulty transferring from industries where employment growth is declining to those where it is growing. The change in the composition of the LTU towards less mobile older workers merely reinforces this notion. Older workers are most likely to have strong family, social, and geographic ties and industry/firm specific skills, precisely the factors which increase the subjective cost of a career change and reduce mobility, making these workers especially susceptible to mismatch.

Table 14

Changes in Unemployment Rate since 1963 by Source of Change

Province	Structural	Policy	Terms of trade	Total
Newfoundland	8.03	0.66	-0.72	7.78
Prince Edward Island	3.06	0.91	-	3.97
Nova Scotia	5.21	0.09	-	5.39
New Brunswick	6.50	1.42	-1.20	6.72
Québec	3.21	-0.22	-	3.10
Ontario	2.21	-0.15	-0.26	1.80
Manitoba	3.22	-0.57	-0.46	2.68
Saskatchewan	3.29	0.48	-0.13	3.65
Alberta	5.29	-0.69	-1.62	2.99
British Columbia	5.38	0.47	-1.99	4.24

In summary, our parameter estimates are consistent with a story where the bulk of the rise in unemployment has been due to structural factors, most important of which were the effects the oil shocks had upon the mix of demand. The change in the mix of demand is reflected in an acceleration of the transition from a goods producing to a service producing economy and the structural unemployment generated is reflected in the rise in LTU.

Natural Rates

Once the unemployment equations have been determined it is possible to calculate natural rates of unemployment, by taking equation (1) (page 3) and solving for $RLURi_t$ for each and every t where the cyclical variables, GAP, MONPOL, CUR and DGDPKi have been set to their normal values.

The formula used for deriving the NRU for province i is given below, where Xi_j represents the vector of significant structural, policy and terms of trade variables used in the final estimated form and βi_j represents the associated vector of estimated coefficients. The summation runs over the js from j=3 to j=n=3 where n is the number of significant non-cyclical explanatory variables.

$$NRUi_t = \frac{1}{1-\hat{\beta}i_1} \times (\Sigma \hat{\beta}i_j Xi_{jt} + \hat{\beta}i_{cur} * 87)$$

By construction the normal values for GAP, MONPOL and DGDPKi are equal to zero. The normal value for CUR is by necessity somewhat arbitrary. We have used 87 (approximately equal to the pre-1973 average CUR, 87.03) as the full capacity CUR. A higher or lower normalization will lead to lower or higher natural rates in Ontario and Québec, the only two provinces where CUR remains a significant explanatory variable. Calculations of the impact on the natural rate of unemployment of increasing the "normal" capacity utilization rate by one is straight forward. It is equal to the derivative of unemployment with respect to CUR --- $1/(1-\beta_1) * \beta_{CUR}$. For Québec that derivative is equal to -0.1513 and for Ontario it is equal to -0.1391. Choosing a "normal" CUR of 90 would lower the natural rate in these provinces by .45 and .41 percentage points,

respectively, while a "normal" CUR of 85 would imply NRUs 0.30 and 0.28 percentage points higher.

Chart 3 through Chart 12 show the NRU for each of the ten provinces as well as the historical unemployment rate. The annual averages of the provincial natural rates are given in Table 15. Chart 13 shows the implied natural NRU defined as the weighted average of the provincial rates with the weights given by provincial labour force share. Chart 14 compares the weighted average national NRU with the natural rate calculated in Burns (1988) using a single reduced form equation. The two measures are in substantial agreement.

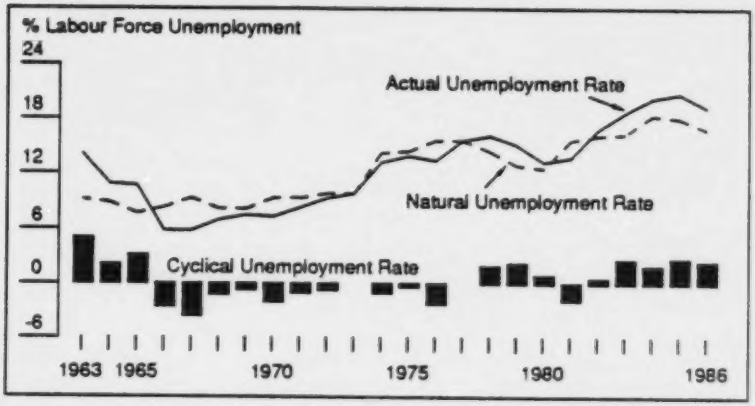
Table 15

Provincial and Weighted Agerage National Natural Rates of Unemployment, 1963-86

	Nfld.	P.E.I.	N.S.	N.B.	Qué.	Ont.	Man.	Sask.	Alta.	B.C.	Can.
1963	9.23	7.13	6.07	6.57	6.50	3.74	3.34	2.52	2.82	5.15	4.77
1964	8.91	7.06	6.31	6.52	6.16	3.92	3.17	2.46	2.86	4.96	4.72
1965	7.62	6.99	5.91	6.53	6.42	3.77	3.37	2.69	2.99	4.95	4.74
1966	8.32	6.95	5.69	6.51	6.13	3.89	3.54	2.62	3.10	5.55	4.77
1967	9.29	6.92	5.66	6.88	6.62	4.17	3.57	2.66	3.62	6.57	5.18
1968	8.18	6.96	5.59	6.32	6.59	4.15	4.19	2.71	4.06	6.36	5.16
1969	8.13	6.85	5.60	6.38	6.82	4.52	4.52	3.10	4.59	6.44	5.45
1970	9.41	6.87	6.12	6.04	6.97	4.68	5.21	3.31	5.32	7.86	5.82
1971	9.38	7.05	6.37	6.08	7.09	4.90	5.37	3.48	5.42	7.30	5.91
1972	9.91	8.39	7.02	8.49	7.01	4.89	5.20	4.34	5.54	7.31	6.02
1973	9.92	8.41	7.55	7.92	7.03	5.06	4.69	3.64	5.00	6.10	5.88
1974	14.26	8.62	8.14	9.25	7.58	5.10	4.05	2.59	4.14	7.04	6.13
1975	14.40	8.74	8.57	11.10	8.18	5.35	4.50	3.63	3.45	8.91	6.65
1976	15.58	9.09	8.74	11.07	8.71	5.67	5.16	3.81	4.21	8.99	7.04
1977	15.59	9.26	9.38	11.46	8.93	5.74	5.75	4.53	4.22	8.38	7.13
1978	14.39	8.88	9.25	10.23	8.69	5.60	5.18	4.07	4.01	7.33	6.78
1979	12.89	8.74	9.59	10.74	8.28	5.38	4.51	3.85	3.45	5.75	6.30
1980	12.50	9.20	9.36	11.31	8.77	5.26	4.82	3.77	3.17	5.58	6.34
1981	15.64	10.03	10.38	12.09	9.67	5.72	5.86	5.43	4.21	8.68	7.40
1982	16.19	11.08	11.71	13.48	10.50	6.62	7.13	6.42	6.93	11.53	8.70
1983	16.28	11.59	12.14	14.07	9.83	6.05	7.13	6.92	8.57	10.00	8.37
1984	18.36	11.64	12.24	14.15	9.80	6.16	6.75	7.09	8.42	11.07	8.55
1985	18.06	11.76	12.26	13.63	9.78	6.14	7.12	7.52	8.52	11.30	8.57
1986	16.90	11.00	11.42	12.53	8.54	5.64	6.38	6.63	8.11	10.49	7.79

Chart 3

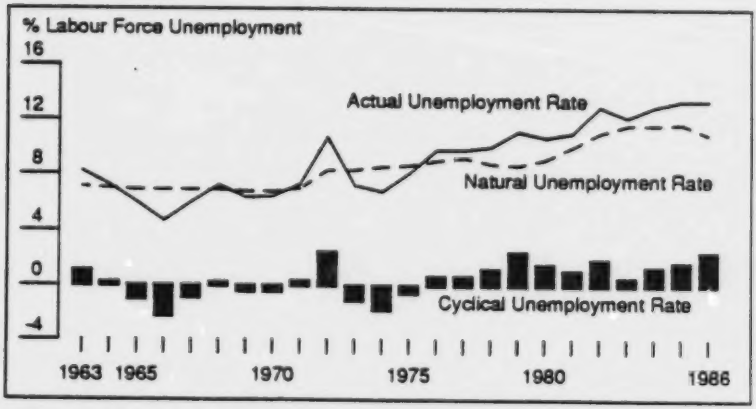
Actual and Natural Rates of Unemployment, Newfoundland, 1963-86



Source Economic Council of Canada, 1989.

Chart 4

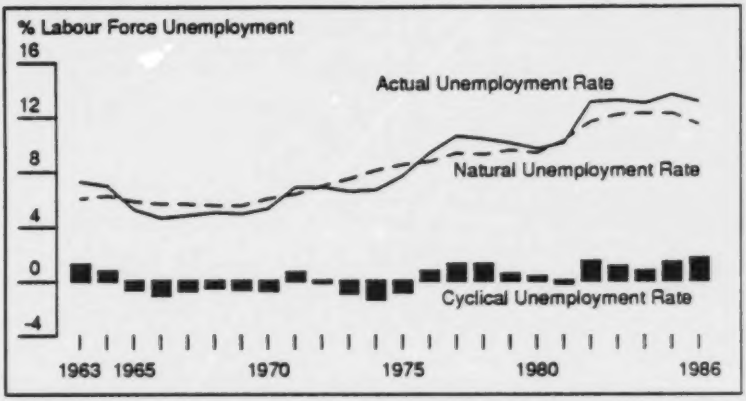
Actual and Natural Rates of Unemployment, Prince Edward Island, 1963-86



Source Economic Council of Canada, 1989.

Chart 5

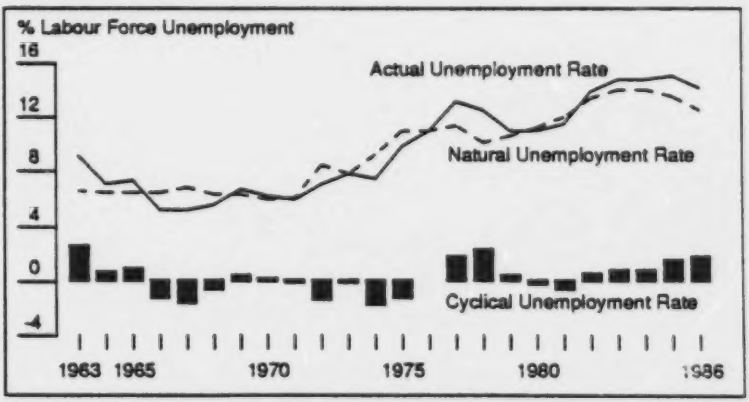
Actual and Natural Rates of Unemployment, Nova Scotia, 1963-86



Source Economic Council of Canada, 1989.

Chart 6

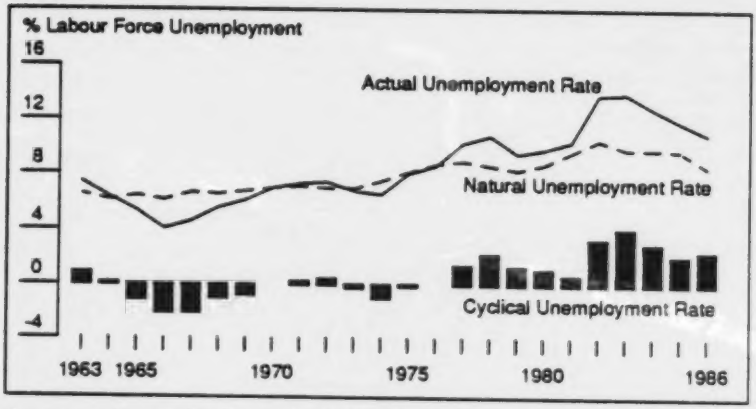
Actual and Natural Rates of Unemployment, New Brunswick, 1963-86



Source Economic Council of Canada, 1989.

Chart 7

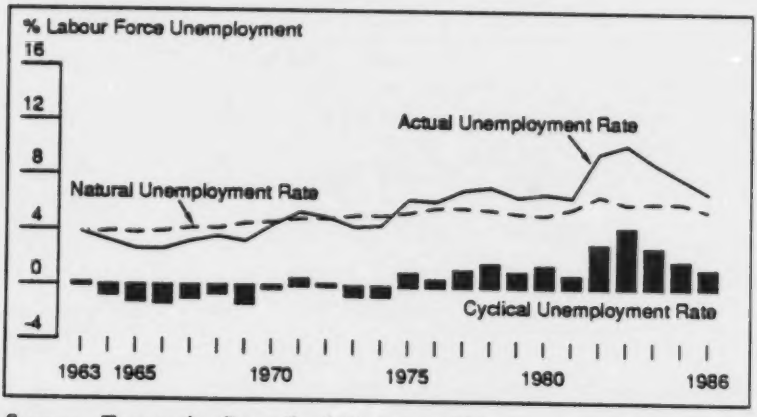
Actual and Natural Rates of Unemployment, Québec, 1963-86



Source Economic Council of Canada, 1989.

Chart 8

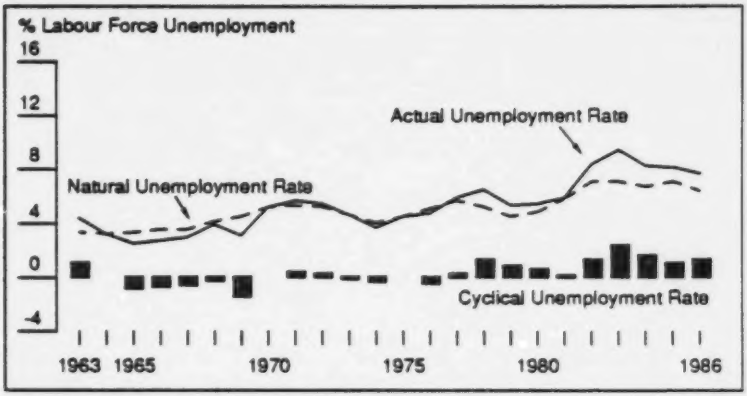
Actual and Natural Rates of Unemployment, Ontario, 1963-86



Source Economic Council of Canada, 1989.

Chart 9

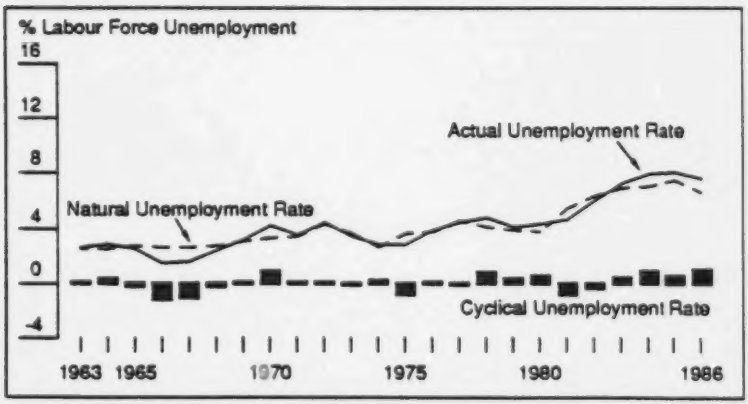
Actual and Natural Rates of Unemployment, Manitoba, 1963-86



Source Economic Council of Canada, 1989.

Chart 10

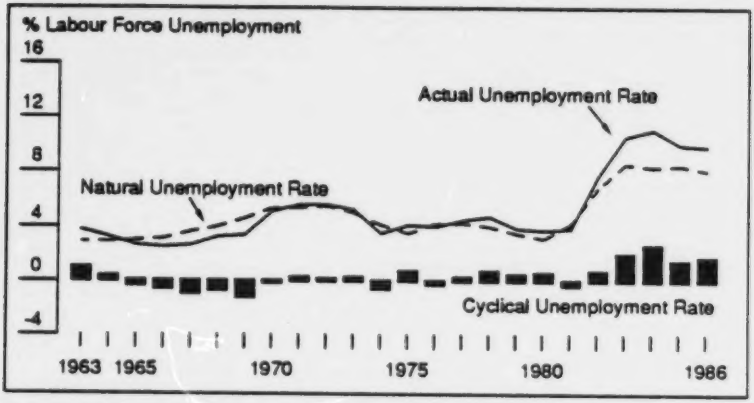
Actual and Natural Rates of Unemployment, Saskatchewan, 1963-86



Source Economic Council of Canada, 1989.

Chart 11

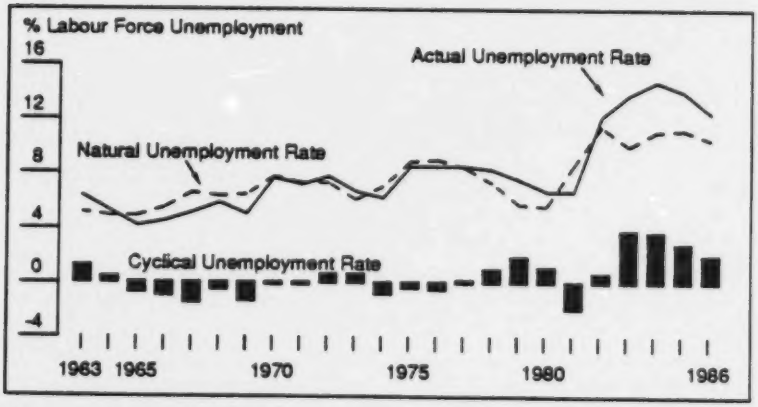
Actual and Natural Rates of Unemployment, Alberta, 1963-86



Source Economic Council of Canada, 1989.

Chart 12

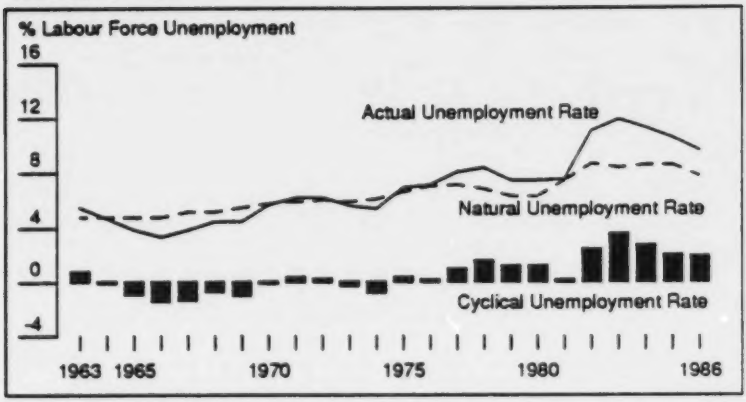
Actual and Natural Rates of Unemployment, British Columbia, 1963-86



Source Economic Council of Canada, 1989.

Chart 13

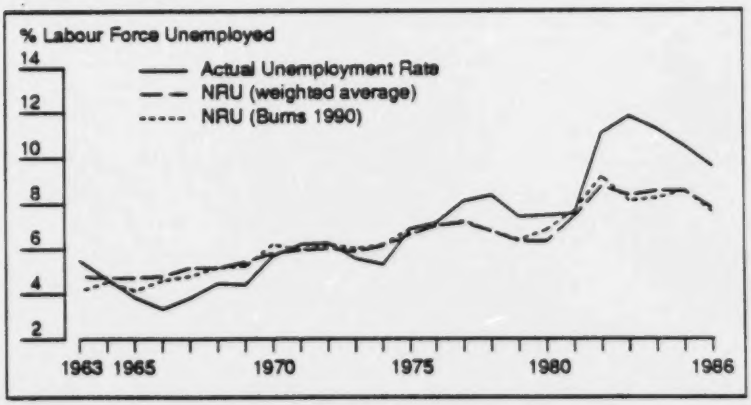
Actual, Natural and Cyclical Rates of Unemployment, Canada, 1963-86



Source Economic Council of Canada, 1989.

Chart 14

Actual and Natural Rates of Unemployment, Canada, 1963-86



Source Economic Council of Canada, 1989.

Below we discuss briefly the characteristics of, and time paths taken by the provincial natural rates.

Atlantic Provinces

The Atlantic provinces' natural rates of unemployment tend to be high relative to historical rates, implying that the bulk of unemployment in these provinces has been structural in nature. The energy shocks, presumably working through the demand side, would appear to have caused considerable disruption of Atlantic provinces' labour markets. Our estimates suggest that as much as 4 percentage points of unemployment over the sample period can be traced to this factor. A further important factor was the rise in wages in the Atlantic provinces relative to Ontario. Our calculations show that significant unemployment was generated in Newfoundland, Nova Scotia and New Brunswick (see Table 5). Unemployment insurance and government involvement in the economy also had unemployment impacts according to our estimates.

Most of the rise in unemployment in the Atlantic provinces has been structural, therefore, supply-side policy responses are called for. It would be inappropriate to attempt to rid these economies of their high levels of unemployment with fiscal and/or monetary stimulus. We have strong evidence that a policy which succeeded in increasing productivity in the Atlantic provinces to a level consistent with its high real wages could substantially reduce structural unemployment in that region.[21] Our equations do not permit us to identify the precise nature of the unemployment caused by the oil shocks: it is, therefore, less clear what precisely would be the appropriate policy response.

In the most general terms, the ideal policy would encourage the expansion of industries which require skills and offer renumeration similar to those of presently unemployed workers. In the absence of such a program (or industries), retraining programs and possibly even relocation incentives might be desirable. To a certain extent some existing support systems tend to exacerbate the situation. In many parts of the country unemployment insurance is used by both firms and workers to subsidise the operation of marginal and sub-marginal industries, impeding the kind of evolutionary change necessary if the market is to respond to high structural unemployment rates.[22] A

system of subsidies which supported sunrise industries as opposed to sunset industries would encourage employment creation and the kind of structural change likely to improve unemployment.

Central Canada

Québec and Ontario have the most industrialized economies in the country and as their estimated natural rates indicate they are the most cyclically sensitive of the provinces. Their natural rates have been least affected by the various structural factors which have operated to increase unemployment in Canada as a whole. In Ontario the combined effect proxied by UNION and RLPGO was 2.97 percentage points which is approximately of the order of the energy effects in the other provinces. Both Ontario and Québec's natural rates have been trending down with the relaxation of energy and minimum wage constraints. Evidence, in the form of the percentage of the unemployed who are LTU, suggests that Québec experienced considerably more difficulties than Ontario with respect to structural mismatch. Natural rates in both these provinces in 1987Q1 are close to their 1973 levels and show no indication of rising in the near future.

Prairies

The Prairie regions, like Atlantic Canada, have experienced significant increases in structural unemployment. Although experience has differed from province to province we can offer a few general observations. First, the degree of structural unemployment experienced in the Prairies is relatively large, although less than in Atlantic Canada. Second, they have recovered more markedly from the high unemployment of the early eighties than have the Atlantic provinces, though levels remain significantly higher than they were in the early seventies. Manitoba's experience most closely reflects Ontario and Québec's. It has experienced a significant fall in structural unemployment since 1982, and in 1986 the natural rate of unemployment is beginning to approach levels achieved in the early seventies. Saskatchewan and Alberta's experience has been less favourable. Saskatchewan's actual unemployment rate has tended to follow the natural rate and, although there is evidence of improvement, the level of structural unemployment remains disturbingly high.

Alberta's natural rate of unemployment has followed a somewhat unusual time profile. Our estimate indicates that the natural rate rose in the late sixties, only to fall around 1974 as the exploration and production activity increased. The natural rate remained more or less steady at approximately 4 per cent until mid-1980 when it rose dramatically achieving a level of 8.5 per cent from which it has more or less failed to return. The alternative estimate outline in Appendix C follows a similar time path, although rates in the eighties are somewhat lower.

British Columbia

British Columbia's natural rate suggests little evidence of cyclical unemployment for much of the sixties and seventies, although a significant employment gap is in evidence over the post-1982 period. British Columbia's unemployment story is different from the other provinces' because commodity prices have played such an important role. If we look at Table B-10 we see that structural unemployment in British Columbia, as proxied by UNION, RLPGB, HYSTB and S_ENGB was on the rise throughout the sixties and seventies. However, favourable developments in commodity prices during the 1970s allowed British Columbia unemployment to remain relatively low despite deep rooted structural problems. In 1979 world commodity prices fell and British Columbia's unemployment skyrocketed, as did it's natural rate. The new higher NRU reflected the various structural factors which had been building during the seventies but whose effects had been hidden by the favourable impact of high world commodity prices. The failure of British Columbia's unemployment rates to recover in the post-1982 period is more a function of the structural problems which built up over the seventies as opposed to depressed commodity prices. Diversification of the domestic economy and improved labour market flexibility will likely be key factors in improving labour market prospects in British Columbia.

Summary

This study quantifies the impact of various factors on provincial unemployment rates. It provides estimates of the relative cyclical sensitivity of unemployment in the ten provinces and of their natural

rates over the period 1963-87Q1. The analysis suggests that most of the rise in unemployment rates since 1963 has been structural in nature. Policy factors, and the terms of trade have played less important, though nonetheless significant, roles.

The estimated natural rates suggest that most of the unemployment in the Atlantic Provinces was, and remains, structural in nature. There is little scope for counter-cyclical policy to improve unemployment levels in these provinces. Unemployment rates in Québec and Ontario follow more pronounced cyclical patterns. As of 1987Q1 there still remained significant slack in these economies. The increase of unemployment in the western provinces was more cyclical than in the Atlantic Provinces but should be classified as largely structural in nature. The western provinces tended to be more sensitive to changes in the terms of trade. British Columbia's unemployment was particularly sensitive to primary commodity prices.

This study strongly suggests that unemployment at this time is largely a structural phenomenon. We infer that a supply-side policy aimed at improving labour market flexibility and reasserting real wage/productivity parity in the Atlantic region would be most effective in reducing unemployment rates. The modelling strategy followed here does not permit more specific policy recommendations to be made. A micro based study could, however, be used to verify the inferences and conclusions which have been drawn from the macro data. The descriptive detail and disaggregation of a micro study coupled with this study's estimates of the quantitative importance of different effects would represent a powerful aid in the formulation of unemployment policy.

Appendixes

Appendix A

The algorithm followed during the nested hypothesis testing process is described in the body of the text. This appendix describes how one anomalous result was dealt with and presents the progression of the ten unemployment rate equations as variables were eliminated.

The estimated coefficients for RWAGEP and PFISH in the Prince Edward Island equation in the unconstrained model, Table A-2, have the wrong sign and are significantly different from zero. Economically, the negative sign on RWAGEP is counterintuitive. The implication is that an increase in the wage of Islanders with respect to Ontarians would result in a decrease in unemployment. *A priori* one would not expect such a result, although conceivably it could be explained by a real income effect. Similarly, the positive correlation between the relative price of fish and fish produce (PFISH) and unemployment runs counter to theoretical expectations. Such a result could arise if fishing as an occupation has a higher marginal propensity to unemployment than alternative occupations. Under this scenario, an increase in PFISH would induce an increase in the fishing industry's labour force share and in the measured rate of unemployment. Neither of these "explanations" is particularly convincing nor seems particularly probable. Below we examine some of the statistical properties of the variables in question and their interaction in the estimated equation.

The two variables are highly correlated ($r = .76$); in an effort to determine the sensitivity of estimates to their inclusion each was eliminated in turn. Elimination of PFISH leads to a sign reversal in RWAGEP, although it tested insignificantly different from zero. Elimination of RWAGEP failed to correct the sign anomaly in the estimated coefficient of PFISH which remained significantly different from zero. Elimination of both variables did not lead to significant changes in the estimated coefficients of the remaining regressors nor did it greatly effect the overall explanatory power of the equation. Compare models 1, 2, 3, 4 in Table A-2.

The robustness of coefficient estimates to the elimination of PFISH and RWAGEP, and the interpretive problems associated with their incorrect signs lead us to somewhat arbitrarily eliminate *both* variables from the regression. This represents a break from our nested hypothesis methodology. In our opinion, however, it is pre-

ferred to the alternative of accepting dubious theoretical rationalisations of the incorrect signs. Apart from these variables in the PEI equation, all other incorrectly signed variables are statistically insignificant and are dealt with according to the nested hypothesis technique outlined above. The progression of each of the ten models can be followed in Tables A-I to A-10.

Tables A-1 to A-10

Table A-1

Nested Hypothesis Testing, Unemployment Rate Equations, Newfoundland

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURF	0.6266	0.6665	0.6619	0.6735	0.6914	0.6937	0.6919	0.6890
	(9.54)	(12.12)	(12.06)	(12.40)	(13.29)	(13.35)	(13.21)	(13.20)
CYCLICAL								
GAP	0.4439	0.3969	0.4216	0.4288	0.4131	0.4085	0.3708	0.3720
	(2.55)	(2.41)	(2.60)	(2.65)	(2.55)	(2.52)	(2.31)	(2.30)
DGDPKF	-8.7187	-8.2012	-7.7157	-7.9066	-8.1785	-7.9745	-6.4008	
	(-1.84)	(-1.74)	(-1.66)	(-1.69)	(-1.75)	(-1.70)	(-1.40)	
MONPOL	-7.3669	-8.6043	-8.8035	-8.6825	-8.6581	-7.6894		
	(-1.26)	(-1.50)	(-1.53)	(-1.51)	(-1.50)	(-1.34)		
STRUCTURAL								
RLPGF	3.3784	3.1120	3.5941	3.3225	3.3452	3.3352	3.7711	3.5874
	(1.68)	(1.62)	(2.15)	(2.02)	(2.03)	(2.03)	(2.32)	(2.22)
RWAGEF	7.3642	10.1682	10.1216	10.0522	10.1445	10.1622	10.1755	10.8756
	(2.09)	(3.60)	(3.61)	(3.58)	(3.65)	(3.65)	(3.63)	(3.87)
S_ENGF	4.2177	4.5759	4.4935					
	(0.76)	(0.82)	(0.81)					
HYSTF	-0.1564							
	(-0.50)							

POLICY								
UIOPPF	0.3751	0.4067	0.3377	0.2739				
	(0.76)	(1.00)	(0.88)	(0.72)				
TAXF_	5.6995	8.4380	7.3179	8.2457	11.8286	10.3573	10.4166	9.3852
	(0.63)	(1.08)	(0.95)	(1.08)	(2.21)	(1.95)	(1.96)	(1.76)
SUB_	-6.8184	-5.6370						
	(-0.58)	(-0.57)						
TERMS OF TRADE								
PFISH	1.6208							
	(0.87)							
PPULP	2.9285							
	(1.06)							
PMINE	-3.0902	-1.3510	-1.4351	-1.4895	-1.5177	-1.3825	-1.1229	-1.0224
R^2	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95
SEE	1.08	1.07	1.06	1.06	1.06	1.06	1.06	1.06
Q(27)	22.87	23.99	23.35	22.52	21.96	21.91	22.62	22.33

Table A-2

Nested Hypothesis Testing, Unemployment Rate Equations, Prince Edward Island

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURP	0.3890	0.3699	0.3861	0.3844	0.3954	0.3997	0.4147	0.4132
	(3.74)	(4.49)	(4.63)	(4.64)	(4.98)	(5.04)	(5.23)	(5.23)
CYCLICAL								
GAP	0.4202	-0.4463	0.3930	0.4004	0.3854	0.3829	0.3692	0.3670
	(2.35)	(2.65)	(2.36)	(2.41)	(2.34)	(2.33)	(2.23)	(2.22)
DGDPKP	-3.4402	-3.8805	-3.1155	-3.2593	-3.7262			
	(-0.71)	(-0.83)	(-0.66)	(-0.69)	(-0.79)			
MONPOL	2.9535							
	(0.41)							
STRUCTURAL								
RLPGP	5.0364	5.0391	5.8116	5.7845	5.7036	5.6741	5.2086	5.1255
	(2.73)	(2.83)	(3.31)	(3.29)	(3.27)	(3.27)	(3.10)	(3.05)
RWAGEP	-7.4987	-7.0358	1.2383					
	(-1.52)	(-1.43)	(0.32)					
HYSTP	-0.0460							
	(-0.13)							

POLICY								
UIOPPP	0.1846	0.1995	0.3678	0.4130	0.4844	0.4876	0.6568	0.7023
	(0.53)	(0.57)	(1.08)	(1.27)	(1.58)	(1.61)	(2.82)	(3.05)
TAXP	-1.6203	-1.2912	12.2610	12.3680	8.3216	7.0721		
	(-0.15)	(-0.12)	(1.26)	(1.27)	(0.99)	(0.86)		
SUBP	4.4857	4.7496	-7.5927	-8.5658				
	(0.26)	(0.30)	(-0.49)	(-0.56)				
TERMS OF TRADE								
PFISH	3.6851	3.6009						
	(2.41)	(2.39)						
CONSTANT	3.1117	2.9808	-0.5945	0.2643	0.0751	0.0559	0.1396	0.1813
	(0.98)	(0.96)	(-0.21)	(0.21)	(0.06)	(0.05)	(0.11)	(0.15)
R^2	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
SEE	1.32	1.30	1.30	1.29	1.28	1.28	1.28	1.28
Q(27)	30.70	31.97	24.53	23.99	24.88	25.22	26.84	27.44

Table A-3

Nested Hypothesis Testing, Unemployment Rate Equations, Nova Scotia

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURS	0.5345 (7.11)	0.5103 (7.26)	0.5353 (7.63)	0.5192 (7.55)	0.5153 (7.52)	0.5213 (7.63)	0.5230 (7.66)	0.5301 (7.77)
CYCLICAL								
GAP	0.2848 (3.09)	0.2967 (3.30)	0.2830 (3.15)	0.3018 (3.42)	0.3225 (3.67)	0.3216 (3.66)	0.3142 (3.58)	0.3098 (3.54)
DGDPES	-5.6172 (-1.50)	-5.6569 (-1.51)	-5.4493 (-1.44)	-5.6602 (-1.50)	-5.8390 (-1.56)	-5.6557 (-1.52)	-5.7662 (-1.55)	-5.9277 (-1.60)
MONPOL	-0.3401 (0.12)	-0.1750 (-0.06)						
STRUCTURAL								
RLPGS	3.7331 (3.73)	3.9483 (4.05)	3.8750 (4.09)	4.0357 (4.32)	4.2548 (4.58)	4.3060 (4.65)	4.1986 (4.55)	4.1025 (4.46)
RWAGES	16.0265 (3.63)	16.0565 (3.66)	15.4796 (3.49)	13.6947 (3.43)	10.7351 (3.31)	10.1217 (3.14)	10.6330 (3.33)	10.6211 (3.33)
S_ENGS	-2.6032 (-0.63)							
HYSTS	-0.1973 (-0.61)							

POLICY								
UIOPPS	-0.3432	-0.3350	-0.3007	-0.2722				
	(-1.79)	(-1.76)	(-1.58)	(-1.44)				
TAXS	14.0882	13.3917	13.9745	11.5993	8.4513	8.6682	8.0306	7.8382
	(3.38)	(3.28)	(3.45)	(3.46)	(3.26)	(3.37)	(3.19)	(3.12)
SUBS	-5.4659	-5.6759	-4.9495	-5.2546	-3.8598	-3.7419	-4.1034	-3.9492
	(-2.06)	(-2.17)	(-1.89)	(-2.02)	(-1.63)	(-1.59)	(-1.75)	(-1.69)
TERMS OF TRADE								
PFISH	-0.5454	-0.3654	-0.7081					
	(-0.68)	(-0.47)	(-0.94)					
CONSTANT	-12.1598	-12.3207	-11.7167	-10.8211	-8.6626	-8.2445	-8.5957	-8.5561
	(-3.95)	(-4.04)	(-3.80)	(-3.70)	(-3.64)	(-3.49)	(-3.66)	(-3.65)
R^2	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
SEE	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.53
Q(27)	75.85	76.10	63.10	72.08	58.67	56.17	57.05	56.10

Table A-4

Nested Hypothesis Testing, Unemployment Rate Equations, New Brunswick

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURN	0.6427	0.6515	0.6508	0.6415	0.6310	0.6383	0.6382	0.6407
	(10.42)	(10.89)	(11.08)	(11.10)	(10.91)	(11.00)	(11.01)	(11.07)
CYCLICAL								
GAP	0.2202	0.2095	0.2203	0.2252	0.2177	0.1902	0.1909	0.1891
	(2.10)	(2.07)	(2.26)	(2.31)	(2.21)	(1.97)	(1.98)	(1.96)
DGDPEN	-4.1363	-5.0695	-4.5693	-4.8238				
	(-1.04)	(-1.27)	(-1.15)	(-1.22)				
MONPOL	-4.7269	-4.7097	-4.4671	-4.335	-3.8915			
	(-1.39)	(-1.40)	(-1.36)	(-1.32)	(-1.19)			
STRUCTURAL								
RLPGN	2.9894	2.8686	2.9270	3.0311	3.0977	3.3803	3.3561	3.2528
	(2.91)	(2.79)	(2.85)	(2.96)	(3.00)	(3.32)	(3.29)	(3.20)
RWAGEN	10.1578	11.8331	11.2941	10.8867	12.0081	11.2875	11.4136	11.8154
	(1.98)	(2.93)	(3.33)	(3.21)	(3.59)	(3.36)	(3.40)	(3.54)
S_ENGN	-6.1722							
	(-1.29)							

POLICY								
UIOPPM	0.5801	0.5541	0.5658	0.6277	0.6731	0.6216	0.6106	0.5977
	(2.84)	(2.73)	(2.84)	(3.65)	(3.97)	(3.71)	(3.66)	(3.59)
TAXN	4.0671	2.8894	3.1070					
	(0.84)	(0.64)	(0.69)					
SUBN	-1.3732	-0.6823						
	(-0.53)	(-0.31)						
TERMS OF TRADE								
PFISH	-1.7617	-1.6232	-1.6791	-1.3952	-1.6388	-1.4227	-1.4037	-1.4278
	(-2.04)	(-1.88)	(-1.95)	(-1.71)	(-2.01)	(-1.75)	(-1.73)	(-1.76)
PPULP	0.9286							
	(0.51)							
CONSTANT	-7.7569	-8.4302	-7.9724	-7.7949	-8.5379	-8.3268	-8.4187	-8.6665
	(-2.57)	(-3.00)	(-3.69)	(-3.60)	(-4.04)	(-3.92)	(-3.97)	(-4.01)
R^2	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
SEE	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Q(27)	37.07	37.12	37.27	37.91	36.70	39.15	39.44	35.19

Table A-5

Nested Hypothesis Testing, Unemployment Rate Equations, Québec

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURQ	0.5994	0.6228	0.6201	0.6226	0.6358	0.6493	0.6531	0.6670
	(8.99)	(9.94)	(10.73)	(10.94)	(11.61)	(11.92)	(11.95)	(12.29)
CYCLICAL								
GAP	0.3059	0.2782	0.2790	0.2810	0.2644	0.2652	0.2490	0.2419
	(3.51)	(3.46)	(3.61)	(3.70)	(3.59)	(3.54)	(3.39)	(3.28)
CUR	-0.0555	-0.0577	-0.0595	-0.0573	-0.0607	-0.0524	-0.0511	-0.0504
	(-3.58)	(-4.14)	(-4.31)	(-4.64)	(-5.13)	(-4.72)	(-4.63)	(-4.56)
DGDPEQ	-13.1446	-12.9302	-12.7412	-12.9383	-13.0700	-13.5460	-12.9920	-12.4618
	(-4.78)	(-4.85)	(-4.78)	(-4.97)	(-5.16)	(-5.36)	(-5.21)	(-5.02)
MONPOL	-3.0735	-3.1799	-3.1234	-3.1391	-2.9722	-2.2093		
	(-1.66)	(-1.79)	(-1.78)	(-1.79)	(-1.70)	(-1.30)		
STRUCTURAL								
RLPGQ	4.3770	3.7607	3.6955	3.7325	3.7205	4.1243	4.2116	3.6853
	(3.59)	(3.67)	(3.77)	(3.86)	(3.86)	(4.44)	(4.55)	(4.37)
UNION	-2.0105							
	(-0.39)							
S_ENGQ	-1.8085							
	(-0.49)							
HYSTQ	0.4878	0.4884	0.5271	0.5187	0.4487	0.4463	0.4411	0.4236
	(1.64)	(1.68)	(1.93)	(1.91)	(1.70)	(1.68)	(1.66)	(1.59)

POLICY								
UIOPPQ	0.0713	0.0734	0.0896	0.0847	0.1087			
	(0.57)	(0.63)	(0.79)	(0.82)	(1.30)			
TAXQ	2.8919	1.9226	1.7627	1.6865				
	(0.91)	(0.84)	(0.77)	(0.75)				
SUBQ	0.0996	-0.6977	-0.6846					
	(0.01)	(-0.01)	(-0.11)					
UMRQ	3.3066	2.7670	2.6470	2.7642	2.9780	3.8859	3.8602	3.3082
	(2.22)	(2.07)	(2.08)	(2.18)	(2.38)	(3.54)	(3.51)	(3.21)
TERMS OF TRADE								
PMILL	-0.0149	0.2485						
	(-0.04)	(0.84)						
PPULP	-0.7114	-0.5739	-0.5802	-0.6292	-0.6752	-0.5956	-0.4959	
	(-0.95)	(-0.88)	(-0.10)	(-1.53)	(-1.67)	(-1.48)	(-1.24)	
PMETAL	0.1627							
	(0.79)							
CONSTANT	3.4955	3.7844	4.1021	3.8396	4.0495	2.4810	2.2189	2.3473
	(1.61)	(1.96)	(2.14)	(2.03)	(2.18)	(1.51)	(1.37)	(1.45)
R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
SEE	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33
Q(27)	38.86	42.36	43.37	42.20	43.47	44.51	48.75	53.32

Table A-6

Nested Hypothesis Testing, Unemployment Rate Equations, Ontario

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURO	0.4956 (7.41)	0.4983 (7.47)	0.5001 (7.47)	0.4947 (7.55)	0.4799 (7.55)	0.4688 (7.44)	0.4743 (7.54)	0.4984 (8.09)
CYCLICAL								
GAP	0.2806 (4.88)	0.2817 (4.92)	0.2829 (4.95)	0.2875 (5.12)	0.3001 (5.48)	0.3008 (5.47)	0.2977 (5.42)	0.2948 (5.30)
CUR	-0.0906 (-7.53)	-0.0900 (-7.70)	-0.0887 (-7.59)	-0.0885 (-7.59)	-0.0880 (-7.55)	-0.0879 (-7.52)	-0.0876 (-7.50)	-0.0808 (-7.62)
DGDPKO	-7.8805 (-2.80)	-7.9403 (-2.83)	-7.9068 (-2.79)	-7.9997 (-2.83)	-7.4679 (-2.69)	-6.7846 (-2.54)	-6.8947 (-2.59)	-7.1155 (-2.66)
MONPOL	-1.0893 (-0.65)	-1.5430 (-0.98)	-1.5087 (-0.96)	-1.4442 (-0.94)	-1.4978 (-0.97)			
STRUCTURAL								
RLPGO	1.7296 (2.41)	1.7199 (2.42)	1.7431 (2.43)	1.7325 (2.42)	1.9929 (3.02)	2.1460 (3.34)	2.1036 (3.28)	2.0519 (3.16)
UNION	7.8928 (2.45)	7.7526 (2.62)	8.1529 (2.76)	8.4586 (2.97)	8.6622 (3.06)	8.9706 (3.18)	9.1134 (3.25)	11.0124 (4.81)
S_ENGO	1.9670 (0.47)	1.8042 (0.44)	1.3947 (0.34)					
HYSTO	0.4122 (1.74)	0.4416 (1.86)	0.4550 (1.91)	0.4618 (1.95)	0.4902 (2.10)	0.4791 (2.05)	0.4769 (2.04)	0.4630 (1.97)

POLICY								
UIOPPO	0.1924	0.1883	0.1691	0.1674	0.1584	0.1478	0.1353	
	(1.69)	(1.68)	(1.51)	(1.50)	(1.45)	(1.35)	(1.24)	
TAXO	-0.5522							
	(-0.21)							
SUBO	-2.7953	1.8882						
	(0.3207)	(0.22)						
UMRO	1.7444	1.7880	1.8269	1.7418	1.8811	1.9687	1.9630	2.2637
	(1.59)	(1.63)	(1.66)	(1.60)	(1.74)	(1.82)	(1.81)	(2.14)
TERMS OF TRADE								
PPULP	-0.8328	-0.8043	-0.7589	-0.7669	-0.9253	-0.8209	-0.8163	-0.7118
	(-1.74)	(-1.87)	(-1.84)	(-1.86)	(-2.47)	(-2.23)	(-2.21)	(-1.92)
PMETAL	-0.0966	-0.1317	-0.1262	-0.1338				
	(-0.61)	(-0.84)	(-0.81)	(-0.89)				
CONSTANT	6.7612	6.7131	6.4139	6.3840	6.1041	5.8436	5.7939	4.4948
	(3.91)	(3.92)	(3.74)	(3.73)	(3.62)	(3.48)	(3.46)	(3.36)
R^2	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
SEE	0.30	0.30	0.30	0.29	0.30	0.29	0.29	0.30
Q(27)	45.79	46.91	47.00	47.26	45.11	43.17	42.85	40.35

Table A-7

Nested Hypothesis Testing, Unemployment Rate Equations, Manitoba

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURM	0.4314	0.4128	0.4094	0.4096	0.4071	0.4114	0.4150	0.4[illegible]4
	(5.12)	(5.04)	(5.00)	(5.03)	(5.01)	(5.07)	(5.11)	(5.16)
CYCLICAL								
GAP	0.3266	0.3566	0.3616	0.3670	0.3688	0.3670	0.3646	0.3597
	(3.75)	(4.20)	(4.27)	(4.39)	(4.41)	(4.40)	(4.37)	(4.31)
DGDPEM	-6.8571	-7.7040	-7.6623	-7.6443	-7.8056	-7.6867	-7.7237	-7.6106
	(-2.26)	(-2.65)	(-2.65)	(-2.65)	(-2.71)	(-2.68)	(-2.69)	(-2.65)
MONPOL	1.9565							
	(0.74)							
STRUCTURAL								
RLPGM	5.0237	5.1244	5.1795	5.2793	5.2690	5.2297	5.2051	5.1986
	(5.01)	(5.35)	(5.50)	(5.90)	(5.89)	(5.86)	(5.83)	(5.81)
HYSTM	0.7198	0.7726	0.7820	0.7742	0.7811	0.7510	0.7497	0.7458
	(2.36)	(2.54)	(2.62)	(2.64)	(2.67)	(2.58)	(2.57)	(2.55)

POLICY								
UIOPPM	0.0628	0.0507	0.0374					
	(0.44)	(0.36)	(0.27)					
TAXM	11.7614	12.4787	12.4597	12.9493	13.0790	12.6531	12.6699	12.5784
	(2.64)	(2.80)	(2.80)	(3.03)	(3.06)	(2.98)	(2.98)	(2.95)
SUBM	-6.3303	-0.4943						
	(-0.66)	(-0.06)						
WMRM	3.2616	3.1648	3.3642	3.5608	3.4685	3.4658	3.4640	3.5111
	(1.61)	(1.55)	(1.66)	(1.86)	(1.81)	(1.82)	(1.81)	(1.83)
TERMS OF TRADE								
PPULP	0.9778							
	(1.18)							
RPGRAIN	-0.2974	-0.2368	-0.2306	-0.2198	-0.2250	-0.2162	-0.2150	-0.2183
	(-3.29)	(-3.04)	(-3.07)	(-3.53)	(-3.62)	(-3.49)	(-3.47)	(-3.53)
CONSTANT	-3.1718	-2.6678	-2.8143	-3.0180	-2.9401	-2.9389	-2.9397	-2.9646
	(-2.14)	(-1.88)	(-1.98)	(-2.42)	(-2.36)	(-2.36)	(-2.36)	(-2.38)
R^2	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
SEE	0.47	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Q(27)	33.50	33.80	33.73	33.21	33.02	32.96	32.99	32.99

Table A-8

Nested Hypothesis Testing, Unemployment Rate Equations, Saskatchewan

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURK	0.6579	0.6639	0.6584	0.6664	0.6713	0.6854	0.6907	0.6914
	(10.86)	(11.11)	(11.89)	(12.29)	(12.61)	(13.01)	(13.13)	(13.04)
CYCLICAL								
GAP	0.1176	0.1247	0.1294	0.1296	0.1287	0.1076	0.1032	0.0925
	(1.99)	(2.11)	(2.19)	(2.20)	(2.20)	(1.90)	(1.83)	(1.65)
DGDPKK	-2.8752	-2.8559	-2.8564	-2.8658	-2.8241	-2.9785	-3.1404	-2.8457
	(-3.58)	(-3.54)	(-3.60)	(-3.61)	(-3.55)	(-3.75)	(-3.96)	(-3.68)
MONPOL	-2.9858	-3.6064	-3.6222	-3.6319	-3.5055	-3.0977	-2.4305	
	(-1.34)	(-1.71)	(-1.72)	(-1.72)	(-1.66)	(-1.48)	(-1.19)	
STRUCTURAL								
RLPGK	2.1599	2.3007	2.2516	2.1789	1.9344	2.1809	2.4490	2.5846
	(2.48)	(3.01)	(2.97)	(2.92)	(3.00)	(3.48)	(4.13)	(4.42)
S_ENGK	7.2697	7.6214	7.7981	7.8319	8.2250	8.1832	9.2625	8.5565
	(2.31)	(2.43)	(2.54)	(2.56)	(2.71)	(2.68)	(3.12)	(2.90)
HYSTK	0.0879	0.1086	0.1537					
	(0.31)	(0.39)	(0.55)					

POLICY								
UIOPPK	0.2168	0.1587	0.1875	0.1838	0.1832	0.2491	0.1742	0.1666
	(1.20)	(1.21)	(1.44)	(1.42)	(1.46)	(2.32)	(1.91)	(1.81)
TAXK	3.1441	4.0021	4.2908	4.3593	4.2059			
	(0.89)	(1.18)	(1.28)	(1.32)	(1.29)			
SUBK	1.0139	1.0163						
	(0.21)	(0.21)						
TERMS OF TRADE								
PMILL	-0.1934	-0.1646	-0.2722	-0.3113	-0.3767	-0.3306		
	(-0.67)	(-0.57)	(-0.96)	(-1.12)	(-1.44)	(-1.25)		
PPULP	-0.2020	-0.4289	-0.4183	-0.4483				
	(-0.30)	(-0.65)	(-0.65)	(-0.70)				
RPGRAIN	-0.2168	-0.2009	-0.2086	-0.1985	-0.2285	-0.2306	-0.2256	-0.2067
	(-2.70)	(-2.50)	(-2.60)	(-2.49)	(-3.49)	(-3.52)	(-3.44)	(-3.16)
CONSTANT	0.4163	0.0605	0.2420	0.3021	0.2980	0.3159	-0.2265	-0.3712
	(0.33)	(0.11)	(0.43)	(0.54)	(0.53)	(0.57)	(-0.61)	(-1.04)
R^2	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
SEE	0.41	0.41	0.41	0.41	0.40	0.40	0.40	0.40
Q(27)	43.32	44.41	45.36	40.62	41.70	38.83	40.72	39.79

Table A-9

Nested Hypothesis Testing, Unemployment Rate Equations, Alberta

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURA	0.5565	0.5668	0.5534	0.5517	0.5479	0.5561	0.5597	0.5586
	(8.64)	(8.76)	(8.57)	(8.10)	(9.30)	(9.41)	(9.48)	(9.49)
CYCLICAL								
GAP	0.3376	0.3554	0.3624	0.3609	0.3691	0.3610	0.3608	0.3619
	(4.83)	(5.06)	(5.21)	(5.24)	(5.39)	(5.26)	(5.26)	(5.28)
DGDPEA	-2.8441	-3.5245	-3.6351	-3.7402	-3.6323	-3.5044	-3.2801	-3.2560
	(-1.43)	(-1.78)	(-1.84)	(-1.89)	(-1.85)	(-1.78)	(-1.67)	(-1.67)
MONPOL	2.0301							
	(0.80)							
STRUCTURAL								
RLPGA	3.0133	3.7695	3.9104	3.9131	3.9439	3.7098	3.7190	3.7131
	(2.72)	(4.03)	(4.19)	(4.19)	(4.26)	(4.03)	(4.04)	(4.04)
S_ENGA	2.2628	1.0670	0.8153					
	(0.44)	(0.21)	(0.16)					
HYSTA	0.0058	0.0170						
	(0.02)	(0.06)						

POLICY								
UIOPPA	0.0395	0.01756	0.0284	0.0311				
	(0.33)	(0.15)	(0.24)	(0.26)				
TAXA	15.6448	16.3523	16.7415	16.7579	17.2150	16.1911	15.6001	15.7062
	(4.42)	(4.62)	(4.80)	(4.89)	(5.62)	(5.33)	(5.21)	(5.25)
SUBA	26.4391	26.0956	26.9988	27.5264	27.5822	28.1773	27.2382	27.3591
	(3.07)	(2.99)	(3.11)	(3.33)	(3.37)	(3.42)	(3.31)	(3.34)
UMRA	-2.2426							
	(-1.48)							
TERMS OF TRADE								
PPULP	-3.6720	-3.5007	-3.7204	-3.7893	-3.7011	-3.5491	-3.5217	-3.5091
	(-4.55)	(-4.37)	(-4.68)	(-4.97)	(-5.69)	(-5.55)	(-5.51)	(-5.50)
CONSTANT	2.8069	1.0541	1.1475	1.1965	1.1345	1.1658	1.1422	1.1385
	(1.95)	(1.47)	(1.60)	(1.72)	(1.77)	(1.81)	(1.78)	(1.78)
R^2	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
SEE	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Q(27)	27.84	25.89	26.30	26.24	26.04	25.40	25.22	25.16

Table A-10

Nested Hypothesis Testing, Unemployment Rate Equations, British Columbia

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RLURB	0.6260	0.6334	0.6320	0.6358	0.6487	0.6575	0.6601	0.6624
	(12.13)	(12.54)	(12.49)	(12.60)	(13.14)	(13.59)	(13.68)	(13.74)
CYCLICAL								
GAP	0.3796	0.3811	0.3928	0.3907	0.3896	0.3806	0.3774	0.3772
	(4.67)	(4.73)	(4.90)	(4.88)	(4.83)	(4.71)	(4.68)	(4.68)
DGDPKB	-6.3051	-6.6090	-6.2152	-6.2654	-6.5784	-6.3580	-6.4090	-6.4339
	(-2.29)	(-2.45)	(-2.34)	(-2.36)	(-2.47)	(-2.38)	(-2.40)	(-2.41)
MONPOL	1.6147							
	(0.60)							
STRUCTURAL								
RLPGB	2.0026	1.8046	1.9428	1.8485	1.7835	1.6694	1.6850	1.6225
	(2.12)	(1.99)	(2.16)	(2.07)	(1.99)	(1.88)	(1.90)	(1.84)
UNION	19.5498	19.9158	19.5244	19.5660	21.5285	20.1343	19.8947	19.6855
	(4.91)	(5.06)	(5.02)	(5.05)	(6.20)	(6.06)	(5.99)	(5.94)
S_ENGB	6.4320	6.5782	6.6084	6.7133	7.7158	7.3302	7.4520	7.2395
	(1.75)	(1.81)	(1.82)	(1.85)	(2.17)	(2.06)	(2.10)	(2.04)
HYSTB	0.5364	0.5288	0.5358	0.5239	0.5295	0.5148	0.5054	0.4920
	(2.17)	(2.16)	(2.20)	(2.16)	(2.17)	(2.11)	(2.07)	(2.02)

POLICY								
UIOPPB	0.2031	0.1858	0.2122	0.2123				
	(1.19)	(1.10)	(1.27)	(1.28)				
SUBB	14.2164	14.3892						
	(0.90)	(0.92)						
TERMS OF TRADE								
PMILL	-1.3442	-1.3557	-1.4757	-1.5318	-1.3378	-1.2780	-1.2483	-1.2750
	(-2.10)	(-3.04)	(-3.49)	(-3.65)	(-3.35)	(-3.22)	(-3.15)	(-3.22)
PPULP	-1.0648	-0.9624	-1.1059	-1.1049	-0.8010			
	(-1.36)	(-1.24)	(-1.44)	(-1.45)	(-1.08)			
PMINE	-1.3878	-1.5113	-1.2620	-1.2392	-1.3998	-1.6703	-1.6585	-1.5689
	(-2.20)	(-2.42)	(-2.30)	(-2.26)	(-2.63)	(-3.47)	(-3.45)	(-3.29)
CONSTANT	-1.0819	-1.0480	-0.8506	-0.7698	-1.5158	-1.6153	-1.6235	-1.5731
	(-1.06)	(-1.06)	(-0.89)	(-0.81)	(-1.96)	(-2.10)	(-2.11)	(-2.05)
R^2	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
SEE	0.50	0.50	0.49	0.49	0.50	0.50	0.50	0.50
Q(27)	25.56	25.15	26.53	26.23	26.55	24.81	25.23	24.95

Appendix B

Table B-1

Change in Unemployment Rates, Newfoundland, 1963-86

	Energy prices	Mineral prices	Wage spillover	Tax based distortions
1963	0.00	0.00	0.00	0.00
1964	-0.09	-0.06	-0.18	0.00
1965	-0.14	-0.12	-1.50	0.15
1966	-0.20	-0.16	-0.62	0.08
1967	-0.23	-0.18	0.09	0.38
1968	-0.26	-0.15	-1.32	0.68
1969	-0.29	-0.25	-1.76	1.21
1970	-0.17	-0.31	-0.62	1.28
1971	0.09	-0.06	-1.24	1.36
1972	-0.23	-0.02	-0.88	1.81
1973	-0.26	-0.43	-0.44	1.81
1974	-0.14	-0.84	3.97	2.04
1975	0.06	-0.61	3.53	2.19
1976	0.58	-0.39	3.97	2.19
1977	0.95	-0.59	4.06	2.04
1978	0.89	-0.79	3.09	1.96
1979	0.89	-1.55	2.74	1.58
1980	1.30	-2.25	2.56	1.66
1981	2.48	-1.45	3.79	1.58
1982	3.37	-0.76	2.91	1.43
1983	3.55	-0.76	2.82	1.43
1984	3.66	-0.61	4.94	1.13
1985	3.78	-0.30	4.06	1.28
1986	2.68	-0.30	3.62	1.66

Table B-2

Change in Unemployment Rates, Prince Edward Island, 1963-86

	Energy Prices	Unemployment Insurance
1963	0.00	0.00
1964	-0.07	-0.00
1965	-0.13	-0.01
1966	-0.17	-0.01
1967	-0.20	-0.01
1968	-0.15	-0.02
1969	-0.28	0.00
1970	-0.26	-0.00
1971	-0.09	0.00
1972	-0.31	1.56
1973	-0.28	1.56
1974	-0.07	1.55
1975	0.07	1.54
1976	0.44	1.52
1977	0.70	1.43
1978	0.68	1.07
1979	0.76	0.85
1980	1.16	0.91
1981	2.03	0.86
1982	2.75	1.19
1983	3.01	1.45
1984	3.17	1.34
1985	3.30	1.33
1986	2.49	1.38

Table B-3

Change in Unemployment Rates, Nova Scotia, 1963-86

	Energy prices	Tax based distortions	Wage spillover	Government subsidisation
1963	0.00	0.00	0.00	0.00
1964	0.02	0.17	0.06	0.00
1965	-0.11	0.29	-0.34	0.00
1966	-0.15	0.25	-0.45	-0.02
1967	-0.13	0.46	-0.73	0.00
1968	-0.09	0.54	-1.02	0.08
1969	-0.24	0.79	-1.19	0.17
1970	-0.31	1.04	-0.79	0.11
1971	-0.13	1.13	-0.79	0.11
1972	-0.31	1.29	-0.11	0.08
1973	-0.22	1.33	0.28	0.08
1974	0.04	1.33	1.07	-0.38
1975	0.26	1.17	1.75	-0.67
1976	0.61	1.17	1.30	-0.40
1977	0.87	1.13	1.70	-0.38
1978	0.89	1.08	1.53	-0.32
1979	0.92	1.08	1.92	-0.40
1980	1.29	1.08	1.86	-0.95
1981	2.27	0.83	1.92	-0.71
1982	3.01	0.79	1.92	-0.08
1983	3.12	0.79	2.03	0.13
1984	3.27	0.75	1.98	0.17
1985	3.36	0.88	1.75	0.21
1986	2.42	1.13	1.64	0.17

Table B-4

Change in Unemployment Rates, New Brunswick, 1963-86

	Energy prices	Fish and fish products prices	Wage spillover	Unemployment insurance
1963	0.00	0.00	0.00	0.00
1964	-0.02	-0.03	-0.00	0.00
1965	-0.14	-0.06	0.16	-0.01
1966	-0.16	-0.13	0.25	-0.02
1967	-0.18	-0.07	0.58	-0.02
1968	-0.16	-0.00	-0.08	-0.01
1969	-0.25	-0.11	0.16	0.00
1970	-0.25	-0.29	-0.00	0.01
1971	-0.07	-0.43	0.00	0.01
1972	-0.27	-0.74	0.66	2.27
1973	-0.25	-1.39	0.66	2.33
1974	-0.02	-1.58	2.06	2.23
1975	0.16	-1.24	3.37	2.24
1976	0.61	-1.51	3.12	2.28
1977	0.88	-1.68	3.54	2.15
1978	0.86	-1.94	3.12	1.61
1979	0.93	-2.20	4.19	1.25
1980	1.27	-1.87	4.03	1.31
1981	2.26	-1.74	3.70	1.29
1982	3.01	-1.41	3.54	1.78
1983	3.15	-1.32	3.54	2.14
1984	3.19	-1.21	3.62	1.98
1985	3.28	-1.21	3.04	1.95
1986	2.33	-1.45	3.12	1.95

Table B-5

Change in Unemployment Rates, Québec, 1963-86

	Energy prices	Hysteresis	Minimum wage
1963	0.00	0.00	0.00
1964	-0.11	-0.10	-0.12
1965	-0.25	-0.09	0.25
1966	-0.33	-0.10	0.05
1967	-0.42	0.01	0.52
1968	-0.36	0.07	0.37
1969	-0.42	0.03	0.70
1970	-0.30	0.10	0.67
1971	-0.11	-0.03	0.72
1972	-0.28	0.02	0.77
1973	-0.19	-0.10	0.82
1974	0.08	-0.05	1.04
1975	0.30	0.15	1.22
1976	0.89	0.08	1.24
1977	1.19	0.14	1.09
1978	1.13	0.01	1.04
1979	1.19	-0.21	0.79
1980	1.66	0.09	0.52
1981	2.88	0.02	0.27
1982	3.60	0.47	-0.07
1983	3.82	-0.15	-0.35
1984	4.01	-0.12	-0.60
1985	4.12	-0.10	-0.75
1986	2.85	-0.05	-0.77

Table B-6

Change in Unemployment Rates, Ontario, 1963-86

	Energy prices	Pulp and paper prices	Hysteresis	Unilabour power	Minimum wage
1963	0.00	0.00	0.00	0.00	0.00
1964	-0.04	0.00	0.02	0.00	0.20
1965	-0.09	0.02	0.02	0.00	0.09
1966	-0.16	0.04	0.06	0.22	0.00
1967	-0.16	0.06	0.06	0.60	-0.12
1968	-0.16	0.10	0.07	0.66	-0.25
1969	-0.21	0.11	0.01	0.77	0.10
1970	-0.19	0.12	0.14	0.88	-0.00
1971	-0.12	0.16	0.06	0.88	0.19
1972	-0.19	0.19	0.04	1.04	0.07
1973	-0.18	0.12	-0.01	1.32	0.08
1974	-0.06	-0.14	0.06	1.37	0.14
1975	0.04	-0.26	0.16	1.54	0.14
1976	0.24	-0.16	0.02	1.76	0.09
1977	0.35	-0.15	0.11	1.76	-0.07
1978	0.33	-0.14	-0.06	1.76	-0.14
1979	0.35	-0.27	-0.02	1.70	-0.11
1980	0.52	-0.35	0.07	1.54	-0.26
1981	0.98	-0.31	0.01	1.59	-0.29
1982	1.27	-0.19	0.36	1.81	-0.37
1983	1.33	-0.04	-0.03	1.54	-0.47
1984	1.37	-0.14	-0.01	1.65	-0.44
1985	1.43	-0.10	-0.04	1.54	-0.43
1986	0.97	-0.11	-0.02	1.54	-0.47

Table B-7

Change in Unemployment Rates, Manitoba, 1963-86

	Energy prices	Grain prices	Hysteresis	Tax based distortions	Minimum wage
1963	0.00	0.00	0.00	0.00	0.00
1964	-0.07	-0.01	-0.22	0.16	-0.03
1965	-0.20	0.09	-0.15	0.22	0.08
1966	-0.29	0.09	-0.05	0.27	0.18
1967	-0.31	0.07	-0.07	0.49	0.06
1968	-0.36	0.17	-0.02	0.60	0.47
1969	-0.45	0.26	-0.18	1.03	0.51
1970	-0.45	0.38	0.18	1.25	0.51
1971	-0.27	0.40	-0.05	1.35	0.60
1972	-0.40	0.42	-0.17	1.35	0.67
1973	-0.27	0.05	-0.14	1.14	0.57
1974	-0.04	-0.84	-0.19	1.25	0.54
1975	0.09	-0.58	0.02	1.08	0.54
1976	0.43	-0.24	-0.08	1.08	0.63
1977	0.67	0.15	0.01	1.03	0.56
1978	0.60	0.17	0.02	0.65	0.41
1979	0.65	-0.03	-0.23	0.60	0.20
1980	1.05	-0.23	-0.06	0.65	0.08
1981	2.13	-0.19	-0.02	0.65	-0.05
1982	2.93	0.13	0.16	0.65	-0.08
1983	3.04	0.20	-0.06	0.65	-0.05
1984	3.25	0.17	-0.16	0.43	-0.27
1985	3.34	0.25	-0.11	0.43	-0.14
1986	2.31	0.35	-0.18	0.76	-0.18

Table B-8

Change in Unemployment Rates, Saskatchewan, 1963-86

	Energy prices	Grain prices	Technological and social changes	Unemployment insurance
1963	0.00	0.00	0.00	0.00
1964	-0.04	-0.02	0.00	0.00
1965	-0.13	0.16	0.46	0.00
1966	-0.19	0.16	0.46	-0.01
1967	-0.19	0.13	0.69	-0.01
1968	-0.17	0.30	0.23	-0.00
1969	-0.23	0.47	1.16	0.00
1970	-0.17	0.68	0.93	0.00
1971	0.04	0.71	0.69	0.01
1972	-0.10	0.75	1.39	0.76
1973	0.02	0.09	0.69	0.80
1974	0.31	-1.49	1.62	0.77
1975	0.52	-1.03	2.78	0.79
1976	0.82	-0.43	0.46	0.77
1977	0.96	0.26	0.23	0.72
1978	0.92	0.30	-0.69	0.54
1979	1.03	-0.06	-0.23	0.43
1980	1.36	-0.40	-0.46	0.44
1981	2.32	-0.33	1.62	0.43
1982	3.10	0.22	0.00	0.58
1983	3.22	0.36	0.46	0.69
1984	3.37	0.30	0.93	0.63
1985	3.54	0.45	1.39	0.60
1986	2.66	0.62	0.69	0.63

Table B-9

Change in Unemployment Rates, Alberta, 1963-86

	Energy prices	Pulp and prices	Government changes	Tax based distortions
1963	0.00	0.00	0.00	0.00
1964	0.02	0.02	0.00	0.00
1965	-0.11	0.10	0.00	0.18
1966	-0.19	0.20	0.00	0.27
1967	-0.23	0.32	0.00	0.71
1968	-0.27	0.54	0.00	0.98
1969	-0.38	0.64	0.00	1.51
1970	-0.36	0.68	0.31	1.87
1971	-0.23	0.87	0.00	1.96
1972	-0.38	1.05	0.00	2.05
1973	-0.27	0.68	0.00	1.78
1974	-0.02	-0.80	0.62	1.51
1975	0.15	-1.47	0.62	1.33
1976	0.50	-0.91	0.46	1.33
1977	0.67	-0.83	0.31	1.25
1978	0.63	-0.80	0.46	0.89
1979	0.72	-1.51	0.62	0.80
1980	1.05	-1.95	0.62	0.62
1981	1.96	-1.75	0.46	0.71
1982	2.50	-1.05	1.86	0.80
1983	2.76	-0.24	2.79	0.44
1984	3.03	-0.80	3.10	0.27
1985	3.24	-0.58	2.94	0.09
1986	2.31	-0.64	2.63	0.98

Table B-10

Change in Unemployment Rates, British Columbia, 1963-86

	Energy prices	Hysteresis	Mineral prices	Technological and social change	Labour power	Price of milled wood
1963	0.00	0.00	0.00	0.00	0.00	0.00
1964	-0.02	-0.10	-0.08	0.00	0.00	0.01
1965	-0.07	-0.06	-0.16	0.11	0.00	-0.01
1966	-0.08	0.06	-0.23	0.11	0.58	-0.04
1967	-0.12	0.01	-0.26	0.16	1.60	0.02
1968	-0.10	0.12	-0.21	0.05	1.75	-0.41
1969	-0.14	-0.09	-0.36	0.27	2.04	-0.42
1970	-0.14	0.36	-0.44	0.21	2.33	0.39
1971	-0.13	-0.15	-0.08	0.16	2.33	0.01
1972	-0.23	0.11	-0.02	0.32	2.77	-0.79
1973	-0.17	-0.17	-0.60	0.16	3.50	-1.77
1974	-0.07	0.03	-1.18	0.38	3.64	-0.90
1975	0.02	0.28	-0.86	0.64	4.08	-0.42
1976	0.17	-0.03	-0.55	0.11	4.66	-0.53
1977	0.32	0.01	-0.98	0.05	4.66	-0.85
1978	0.32	-0.04	-1.12	-0.16	4.66	-1.49
1979	0.41	-0.08	-2.20	-0.05	4.52	-2.00
1980	0.66	-0.11	-3.18	-0.11	4.08	-0.92
1981	1.11	0.05	-2.06	0.38	4.23	-0.18
1982	1.48	0.79	-1.08	0.00	4.81	0.38
1983	1.59	0.01	-1.07	0.11	4.08	0.13
1984	1.68	0.11	-0.86	0.21	4.37	0.41
1985	1.79	-0.13	-0.42	0.32	4.08	0.50
1986	1.27	-0.11	-0.42	0.16	4.08	0.35

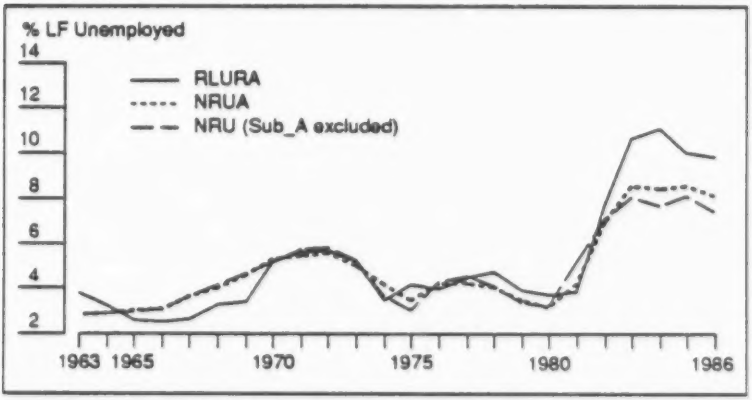
Appendix C

Exclusion of SUB_A from the Alberta unemployment equation had a significant effect on the estimated natural rate of unemployment in Alberta. Chart C-1 compares Alberta's natural rate with SUB_A included and excluded from the estimation process. The principal effect of exclusion is to lower the natural rate towards the end of the sample period implying that Alberta has been affected more significantly by cyclical factors than our previous estimate would suggest.

Table C-1 shows the model progression for Alberta when SUB_A is excluded *a priori*. The equations are more or less identical to those presented in the main body of the text. Table C-2 shows the natural rate of unemployment for the ten provinces and for Canada as a whole implied by the estimated coefficients. A quick comparison between the estimates reported in the main body of the text shows these figures to be more or less identical, The principal effect of excluding SUB_A, other than its effect on the Alberta equation itself was to make UIOPPF significant and TAXF insignificant in the Newfoundland equation. The change in the variables' significance is due to changes in the estimating co-variance matrix caused by the exclusion of SUB_A. The switch reflects the relatively high degree of collinearity between these variables ($r = .86$). The fact that TAXF lost significance and UIOPPF became significant should alert us to the dangers involved in interpreting too narrowly the statistical significance and insignificance of our macro proxies. Many of these variables include a significant trend and are likely proxying for more than one effect.

Chart C-1

Provincial Natural and Actual Rates of Unemployment, Alberta (SUB_A excluded *a priori*), 1963-86



Source Economic Council of Canada, 1989.

Table C-1

Results of Nested Hypothesis Testing for Alberta when SUB_A is excluded *a priori*, Unemployment Rate Equations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RLURF	.6737	.6622	.6625	.6587	.6683	.6675	.6642	.6701	.6729
	(13.25)	(13.09)	(13.76)	(13.94)	(14.10)	(14.10)	(14.04)	(14.16)	(14.22)
CYCLICAL									
GAP	.3008	.3249	.3258	.3263	.3323	.3331	.3360	.3309	.3283
	(4.23)	(4.61)	(4.64)	(4.65)	(4.71)	(4.72)	(4.76)	(4.69)	(4.65)
DGDPKA	-4.6874	-5.1145	-5.0406	-4.8065	-5.1178	-5.0836	-5.0456	-5.1665	-5.1769
	(-2.40)	(-2.61)	(-2.60)	(-2.48)	(-2.66)	(-2.64)	(-2.63)	(-2.69)	(-2.69)
MONPOL	2.1701	2.1150	2.4795	3.0678					
	(.82)	(.88)	(1.08)	(1.35)					
STRUCTURAL									
RLPGA	4.1486	5.2159	5.2285	5.2587	5.0089	5.0088	5.0555	4.9664	4.9274
	(3.72)	(5.55)	(5.59)	(5.80)	(5.57)	(5.57)	(5.63)	(5.52)	(5.48)
S_ENGA	6.4577	4.0772	4.3623						
	(1.27)	(.81)	(.88)						

HYSTA	.0344 (.13)								
POLICY									
UIOPPA	.0329 (.26)	.0216 (.18)							
TAXA_	13.6409 (3.80)	14.8055 (4.24)	15.0884 (4.84)	14.6209 (4.76)	14.2864 (4.63)	14.0867 (4.59)	14.2171 (4.64)	13.8733 (4.53)	13.7715 (4.49)
UMRA	-2.0877 (-1.33)								
TERMS OF TRADE									
PPULP	-3.0942 (-3.82)	-3.1450 (-3.97)	-3.0570 (-4.52)	-3.0019 (-4.70)	-3.0439 (-4.72)	-3.0512 (-4.72)	-3.0883 (-4.79)	-3.0307 (-4.70)	-3.0032 (-4.65)
CONSTANT	1.3243 (.92)	-.03449 (-.59)	-.4114 (-.79)	-.4558 (-.88)	-.2817 (-.55)	-.2703 (-.53)	-.2655 (-.52)	-.2617 (-.51)	-.2636 (-.52)
R^2	.97	.97	.97	.97	.97	.97	.97	.97	.97
SEE	.48	.48	.48	.48	.48	.48	.48	.48	.48
Q(27)	31.17	31.75	31.96	30.85	28.33	28.42	28.55	28.31	28.23

Table C-2

Provincial Natural Rates of Unemployment, (SUB_A excluded *a priori*), 1963-86

	Nfld.	P.E.I.	N.S.	N.B.	Qué.	Ont.	Man.	Sask.	Alta.	B.C.	Can.
1963	9.20	7.15	6.04	6.58	6.50	3.74	3.36	2.52	2.84	5.17	4.78
1964	8.97	7.09	6.29	6.53	6.17	3.94	3.18	2.46	2.90	4.98	4.73
1965	7.78	7.02	5.90	6.54	6.42	3.78	3.38	2.68	2.98	4.97	4.75
1966	8.49	6.97	5.69	6.52	6.13	3.89	3.55	2.62	3.05	5.54	4.77
1967	9.08	6.94	5.67	6.89	6.62	4.16	3.60	2.65	3.64	6.54	5.17
1968	7.83	7.00	5.61	6.33	6.58	4.14	4.18	2.71	4.13	6.35	5.15
1969	7.45	6.88	5.62	6.39	6.82	4.51	4.50	3.08	4.69	6.44	5.44
1970	8.53	6.90	6.14	6.05	6.97	4.69	5.21	3.29	5.20	7.76	5.79
1971	8.21	7.08	6.40	6.09	7.09	4.90	5.35	3.46	5.76	7.27	5.92
1972	9.94	8.65	7.03	8.50	7.01	4.88	5.17	4.33	5.80	7.30	6.03
1973	10.30	8.74	7.55	7.92	7.04	5.05	4.68	3.65	5.24	6.17	5.91
1974	14.17	8.95	8.14	9.24	7.58	5.10	4.08	2.59	3.68	7.04	6.10
1975	13.94	9.05	8.56	11.09	8.17	5.37	4.52	3.61	2.99	8.84	6.60
1976	14.73	9.42	8.74	11.06	8.71	5.68	5.15	3.83	4.27	8.96	7.03
1977	15.00	9.58	9.37	11.44	8.92	5.74	5.73	4.55	4.56	8.38	7.15
1978	13.74	9.14	9.24	10.20	8.69	5.60	5.17	4.09	4.11	7.38	6.78
1979	13.19	9.00	9.57	10.71	8.28	5.38	4.50	3.86	3.33	5.85	6.31
1980	13.43	9.43	9.36	11.29	8.77	5.26	4.84	3.80	3.21	5.64	6.37
1981	15.40	10.27	10.38	12.07	9.67	5.72	5.87	5.41	5.17	8.69	7.49
1982	15.73	11.39	11.69	13.47	10.49	6.64	7.13	6.43	7.06	11.46	8.71
1983	16.07	11.99	12.12	14.06	9.83	6.04	7.10	6.93	8.03	10.03	8.31
1984	17.86	12.11	12.21	14.14	9.80	6.16	6.73	7.09	7.67	11.08	8.46
1985	17.19	12.19	12.25	13.63	9.78	6.13	7.08	7.51	8.08	11.33	8.52
1986	15.98	11.33	11.41	12.51	8.54	5.62	6.37	6.63	7.41	10.49	7.70

Data Appendix

RLURi	Provincial rate of unemployment. Source: Conference Board of Canada (CBOC) historical data base.
GAP	Difference between the national unemployment rate and the Natural rate of unemployment as calculated in Burns (1988). Source: Burns (1988), CBOC.
CUR	Bank of Canada's industrial capacity utilization rate.
DGDPKi	Difference between provincial real GDP and trend GDP, where trend was calculated as *per* Prescott (1986). Source: CBOC.
RLPGi	Energy Price Index divided by provincial CPI. Source: CBOC.
UNION	Percentage of non-farm labour force who are members of unions. Source: Labour Canada Directory of Labour Organisations.
S_ENGi	Employment dispersion variable, calculated using the formula reported in the text where e_i = employment in the construction, agricultural, commercial services, manufacturing, non-commercial services, other primary and public administration industries. Source: CBOC.
HYSTi	Derived from UNION and RLURi as explained in the text.
RWAGEi	Ratio of provincial manufacturing wage and Ontario Manufacturing wage. Source: Statistics Canada.

UIOPP*i*	Provincial Unemployment Insurance generosity, calculated as a percentage of national UI coverage multiplied by the ratio of national entitlement/ benefit period ratio times the ratio of provincial average weekly payment and average weekly earnings.
TAX*i*	Federal and Provincial Income taxes as a percentage of provincial GDP. Source: CBOC.
SUB*i*	Subsidies to businesses divided by provincial GDP Source: CBOC.
WMR*i*	Provincial minimum wage divided by average provincial industrial wage. Source: Labour Canada, Statistics Canada.
MONPOL	M1 growth less the growth in real output less inflation. Source: CBOC.
PFISH	Fish and Fish products price index divided by CPI. Source Statistics Canada.
PMILL	Milled forestry products price index divided by CPI, Source: Statistics Canada.
PPULP	Pulp and paper products price index divided by CPI. Source: Statistics Canada.
PMINE	Metal and mineral products price index divided by CPI. Source: Statistics Canada.
PGRAIN	Grain and grain products price index divided by CPI. Source: Statistics Canada.

Notes

1 Beach and Kaliski (1985) criticise the Lilien, Samson papers for precisely this shortcoming.

2 The Baily model has been criticised because energy, in most production processes, represents only a small proportion of costs. Several works (i.e., Hulton et al., [1987]) have failed to find evidence of capital asset devaluation as predicted by Baily's model. To a large extent the first question is addressed by Hamilton's (1988) work while Struckmeyer (1987) notes that those who argue that energy is a substitute, not a complement, to capital have based their arguments on results derived from translog production functions, a functional form more appropriate to describing opportunities for *ex ante* substitution than the kind of *ex post* complementarity envisaged by Baily.

3 Burns (1988), Gisser and Goodwin (1986), and Louangi (1987) *inter alia*.

4 As much as 25 per cent of the variation in employment dispersion indexes can be explained by relative energy prices.

5 S_ENG*i* was derived by regressing the provincial employment dispersion index $[\sum_{j=1}(ei_{jt}/Ei_t)(\Delta\ln ei_{jt} - \Delta\ln Ei_t)^2]^{1/2}$ on GAP and RLPG*i* and a time trend using GLS in order to correct for serial correlation in the error term (ei_{jt} is employment in province i, sector j at time t, Ei_t is total employment in province i, at time t and the summation runs over the j sectors). S_ENG*i* is equal to the index less GAP and $RLPG_i$ times their estimated coefficients. S_ENG*i* is therefore orthogonal to both GAP and RLPG*i* and free from the endogeneity criticisms originally laid against Lilien and Samson by Abraham & Katz (1986) and Louangi (1986) *inter alia*.

6 The argument mirrors the development literature's discussion of the unemployment creating distortions caused by high *wage sectors in the LDCs.

7 See Coe (1985), Bruno (1986), Coen and Hickman (1987, 1988), Grub, Jackman & Layard (1983), Layard & Nickell (1986), Malinvaud (1982), Montgomery & Shaw (1988) among many

others who discuss these effects of high real wages on unemployment in the European context.

8 Although Blanchard & Summmers (1986) specifically cite unions there is nothing in the model which precludes similar effects from arising in a less structured non-union environment. The degree of unionisation is, therefore, proxying for the degree to which labour markets can be characterised by insider-outsider behaviour. A significant role for HYST*i* should not be taken as condemning unions *per se*.

9 HYST*i* tests only for the existence of the symptoms of hysteresis. Hysteresis is a profoundly micro based phenomenon and tests of its existence and quantification are correctly made at the micro level with panel data.

10 Both TAX*i*_ and SUB*i*_ below have been purged of cyclical influence. TAX*i* and SUB*i* were regressed against GAP and a time trend using GLS to correct for serial correlation. TAX*i*_ and SUB*i*_ are equal to the unpurged variable less the estimated coefficient on GAP times GAP.

11 To the extent that subsidisation is ineffective and reflects an excessive and/or distorting government influence we would expect its unemployment effect to be positive. Thus the sign on this coefficient could be interpreted as a test on the effectiveness of government subsidisation programs.

12 Full in the sense that 95 per cent of the effects of the shock have been absorbed into the system.

13 The Council's *Adjustment for Trade Sensitive Industries* (1988), p. 32, makes the point that the more densely industrialized and populated a region the less difficult adjustment will be.

14 Based on a regression of the provincial unemployment gap on the national gap after serial correlation had been corrected for.

15 Stable in the sense that output fluctuations are dependent not so much upon fluctuations in domestic aggregate demand as upon weather and external world market factors.

16 The Newfoundland Royal Commission on Employment and Unemployment has described some areas of Newfoundland in these terms.

17 See Raynauld (1988) for a discussion of this debate.

18 Were productivity to explain the increase in relative wages, RWAGE should have had no effect on Newfoundland's unemployment rate. RWAGE's significance and positive sign support the wage spillover story.

19 The significance of the unemployment insurance variable was sensitive to model specification. Under very slightly altered specifications unemployment insurance was significant in Newfoundland, Québec, Ontario and British Columbia. This leads us to believe that the unemployment insurance system has had employment effects in provinces other than these three.

20 Calculations based on long term unemployment data in Statistics Canada *The Labour Force*.

21 A reduction in real wages would have the same effect on unemployment levels.

22 In the context of natural rates of unemployment in the order of 14 per cent the present system of extended benefits is particularly counterproductive, providing as much as 32 weeks (or 8 months) of income to unemployed workers. Such an important, long term and secure source of supplementary income cannot help but impede market adjustment.

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